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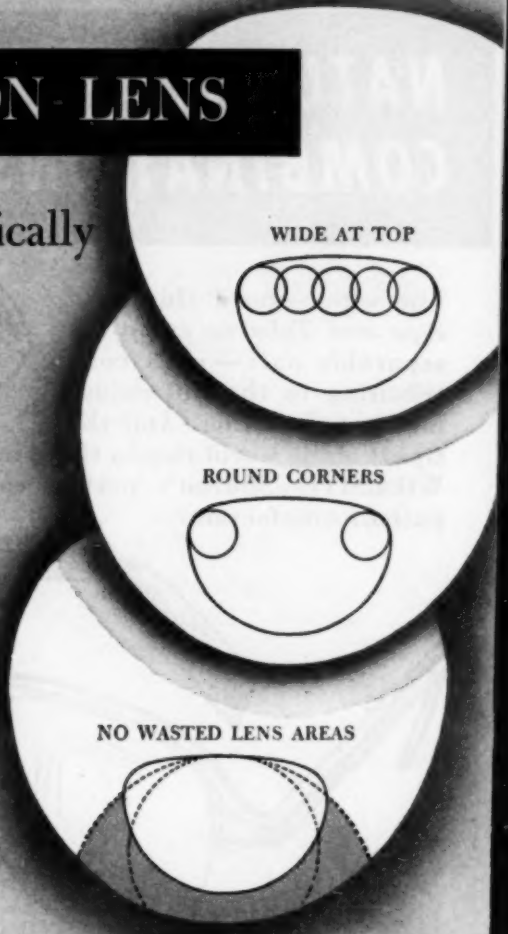

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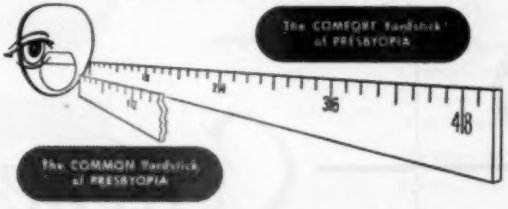

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AMERICAN JOURNAL OF OPHTHALMOLOGY

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INTEGRATED AND BURIED IMPLANTS

A COMPOSITE REPORT OF STUDIES ON THE RESULTS OBTAINED FROM THE USE OF MOBILE ARTIFICIAL-EYE IMPLANTS AT COOK COUNTY HOSPITAL, CHICAGO; VETERANS ADMINISTRATION HOSPITAL, HINES, ILLINOIS; THE ILLINOIS EYE AND EAR INFIRMARY, CHICAGO; AND THE WILMER OPHTHALMOLOGICAL INSTITUTE OF THE JOHNS HOPKINS HOSPITAL, BALTIMORE, FROM THE YEARS 1946 TO 1950

A. P. DRUCKER, M.D., W. W. KREFT, M.D., M. D. PEARLMAN, M.D., J. A. ROSENAU, M.D., AND RUSSELL T. SNIP, M.D.

INTRODUCTION

EDITOR'S FOREWORD

The following discussion consists of reports, concerning the insertion of various types of integrated and buried implants into the orbits, presented before the Chicago Ophthalmological Society and the Wilmer Residents Association in 1950.

It represents the experiences of several large ophthalmic clinics and is valuable in giving us a composite picture which helps to dispel some of the clouds that arose from early enthusiasms. It gives us a sensible evaluation of the worth of these implants.

The final word is not yet, of course, and composite studies such as these will continue to be necessary as long as new implants are devised and complications ensue, for the father of a child is often not aware of his son's deficiencies.

MOBILE IMPLANTS AT COOK COUNTY HOSPITAL*

(1947 to 1949, inclusive)

A. P. DRUCKER,† M.D., and J. A. ROSENAU,‡ M.D.

During the three years covered by our report, 36 eviscerations and 142 enucleations were performed by the attending and resident staff of Cook County Hospital, Chicago. Most of these procedures were done on accident cases with severe ocular trauma.

In this series of operations, 35 orbits were closed without any kind of implant; 94 glass Mules's spheres were used (only two of which are known to have extruded); and 56 primary and delayed mobile artificial-eye implants were employed.

Among the 56 implants, the following types were represented:

INTEGRATED IMPLANTS	
Cutler ring-type	4
Cutler mesh scleral	5
Cutler mesh	32
Modified Cutler mesh	3
Stone-Jardon mesh	4
Buried implants	
Hoffman	6
Troutman magnetic	2
Total	56

* This paper was presented before the Chicago Ophthalmological Society, May 1950.

† Formerly of the Department of Ophthalmology, Cook County Hospital, Chicago; now of 406 North San Mateo Drive, San Mateo, California.

‡ Formerly of the Department of Ophthalmology, Cook County Hospital, Chicago; now of Scottsbluff, Nebraska.

Because of the migratory habits of many of the patients treated in our department, only 37 of the 56 patients in whom the mobile implants were used were available for reëxamination. This number represents too small a series to be considered statistically significant. However, when our data are added to those of other institutions, the combined findings may become statistically significant.

It should be noted here that most of the mobile implants used at Cook County Hospital were inserted by the Tenon's capsule closure technique described by Newell, Zeller, and Kupersmith.[1]

The Stone-Jardon Implant*

(1947 to 1950)

W. W. Kreft,† M.D.

This paper represents a comprehensive study of the results obtained in 30 cases in which the Stone-Jardon implant was inserted. In this group, there were 23 primary and seven secondary procedures. Of the 30 implantations, two have been removed and plastic spheres substituted.

The eyes in this series were removed for a number of causes, including tumor, absolute glaucoma, trauma, and so forth.

A complete summary of the results of the study at the Hines Veterans Administration hospital is given in the section on mesh implants.

* From the Department of Ophthalmology, U. S. Veterans Administration Hospital, Hines, Illinois. Published with the permission of the Chief Medical Director, Department of Medicine and Surgery, Veterans Administration, who assumes no responsibility for the opinions expressed or the conclusions drawn by the author. Presented before the Chicago Ophthalmological Society, May 1950.

† Formerly of the Department of Ophthalmology, U. S. Veterans Administration Hospital, Hines, Illinois; now of 940 Jefferson Building, Peoria, Illinois.

Results of Mobile Orbital Implants*

(1947 to 1950)

Maurice D. Pearlman,† M.D.

This report is based on a survey of the newer types of orbital implants inserted following enucleation at the Illinois Eye and Ear Infirmary and the Illinois Research Hospital. It includes 102 cases operated on between March, 1947, and early 1950. Among the 102 implants, the following types were represented:

Integrated implants	
Cutler ring-type	14
Cutler mesh	4
Stone-Jardon mesh	31
Guyton exoplant	24
Beard mesh and ring	2
Total	75

Buried implants	
Hoffman	4
Troutman magnetic	20
Allen plastic	3
Total	27

Some of the patients were operated on by members of the visiting staff. In the majority of cases, however, the operation was performed by the residents. With three exceptions, the implantations were performed at the time of enucleation.

In the follow-up examinations, the following observations received particular attention:

A. Implant
   1. Extrusion or removal
   2. Primary position
   3. Range of movements
B. Conjunctiva
   1. Redness or edema
   2. Overgrowth or retraction
   3. Secretion

* From the Illinois Eye and Ear Infirmary and the University of Illinois, Chicago. Presented before the Chicago Ophthalmological Society, May, 1950.

† Address: 904 West Adams Street, Chicago 7, Illinois.

C. Prosthesis
   1. Primary position
   2. Extreme range of excursion
   3. Immediate movement straight ahead (For example, oscillations)
D. Lids
   1. Sunken upper lid
   2. Palpebral fissure: Ptosis or abnormal width
E. Subjective impressions
   1. General appearance
   2. Comfort
   3. Cleanliness

Integrated implants and exoplants*

(1946 to 1950)

Russell T. Snip,† M.D.

In the period from March, 1946, to March, 1950, a total of 145 integrated orbital implants and exoplants were inserted at the Wilmer Institute; 106 were primary procedures immediately following enucleation and 39 were secondary insertions following the removal of a previously inserted implant or some months or years after simple enucleation. A tabulation of the results obtained with the several types of semiburied implants and exoplants used up to April, 1948, (a total of 68 cases) has been reported by Guyton.[2]

The present report represents a follow-up of these cases, with inclusion of 77 additional cases having postoperative follow-up of four months or longer, unless extrusion occurred or seemed certain within a shorter interval in which event the case was included as an extrusion.

Integrated implants

Cutler ring type

Cook County Hospital

Of the four Cutler ring-type implants inserted and followed at the Cook County Hospital, two were extruded and two showed cosmetically satisfactory mobility without annoying secretion. One of these, however, had conjunctiva overgrowing the face of the implant.

Illinois Eye and Ear Infirmary

From March, 1947, to March, 1948, 14 Cutler ring-type implants were inserted at the Illinois Eye and Ear Infirmary. After this time, the procedure was abandoned in favor of other procedures having fewer technical difficulties.

Fig. 1 (Drucker, et al.). Cutler ring implant in place after 26 months, showing conjunctival edema, injection, and overgrowth.

Of these 14 implants, five were removed because of muscular detachments from the implant ring and seven were still in place after 23 to 29 months. Two of the cases were unavailable for follow-up.

The lids and palpebral fissures had, in general, a normal appearance. The mobility of both implant and prosthesis was good. In two cases, the conjunctiva had overgrown the face of the implant. Portions of the ring be-

* From the Wilmer Ophthalmological Institute of The Johns Hopkins Hospital and University, Baltimore, Maryland. Presented at the meeting of the Wilmer Residents Association, Baltimore, April, 1950.

† Formerly of the Wilmer Institute; now of 505 Howard Street, San Antonio, Texas.

came exposed in two cases, and the conjunctiva showed no inclination to repair the breach.

Conjunctival secretions were variable. Of the five cases seen most recently, two had little or no discharge, two had moderate discharge, and one had profuse mucopurulent discharge associated with edema of the conjunctiva (fig. 1). In one case, there was a narrowed palpebral fissure.

Wilmer Ophthalmological Institute

Between March, 1946, and March, 1947, 23 Cutler ring-type implants were inserted at the Wilmer Institute; 21 were inserted at the time of enucleation and two were secondary insertions. Both secondary implants were extruded within four months.

MAJOR COMPLICATIONS*
(23 cases)

COMPLICATION	NUMBER	PERCENT
Extrusion	17	74
Orbital cellulitis	1	4
Hemorrhage (postoper.)	1	4
Ruptured muscle	4	17
Exposed ring	8	35
Secondary operation	11	48

MINOR COMPLICATIONS AND CARE†
(Six cases not extruded)

COMPLICATION	NUMBER	PERCENT
Excisions of granulations	0	0
Conjunctivitis requiring chemotherapy	1	16
Discharge		
Slight	4	68
Moderate	1	16
Profuse	1	16
Cleansing		
More than daily	3	50
Daily	3	50
Less than daily	0	0

COSMETIC RESULTS‡
(Six cases not extruded)

COMPLICATION	NUMBER	PERCENT
Straight in primary	5	84
Deviated 10° or more	1	16
Abnormal lid fissure	1	16
Sunken eye	1	16
Subjective		
Excellent	5	84
Fair	1	16
Poor	0	0

Of the primary insertions, six of the 21 are still in place and have given excellent cosmetic results after follow-up periods of six to 41 months, the average follow-up period being 29 months; 15 were extruded at intervals of one day to 26 months after insertion, the average extrusion occurring six months after insertion.

The usual course resulting in extrusion was gradual exposure of a segment of the ring, usually above, with eventual detachment of the muscle.

Mesh-Type Implants

CUTLER MESH SCLERAL IMPLANTS

This type of implant was used only at the Cook County Hospital, Chicago, and in only five cases, three of which were available for reëxamination. Of these three, one had extruded, one had severe secretion with poor mobility, and the third, although well placed and with little secretion, had only fair mobility.

CUTLER MESH IMPLANTS

Cook County Hospital

Of the 32 patients at Cook County Hospital, Chicago, who had Cutler mesh implants,

* *Major complications* include the number of extrusions and those factors which appeared to endanger retention of the implant or exoplant.

† Items tabulated under *Minor complications and care* illustrate principally the amount of conjunctival discharge or irritation in those cases in which there was no extrusion.

‡ *Cosmetic results* include only those cases of retained implants or exoplants in which the patients' records were sufficiently complete to permit tabulation.

The results outlined in the various tabulations from the Wilmer Institute necessarily show considerable overlapping.

16 returned for reëxamination. In three cases, the implant had extruded; there was troublesome secretion in eight cases; some amount of mesh was exposed in four cases; and there was conjunctival overgrowth in nine cases.

Cosmetically satisfactory mobility was present in eight of the 16 follow-up cases, and in five of these the implants were considered to be completely successful.

One Cutler mesh implant (in an eight-year-old boy), not included in these statistics because it had been inserted elsewhere, had to be removed because of mesh exposure and pneumoccocic conjunctivitis with two recurrences of pneumococcic meningitis.

Three modified Cutler mesh implants were inserted at this institution and all were available for follow-up. Of these, two showed complete conjunctival overgrowth and were no longer integrated; the third, although successfully implanted and with only a slight secretion, had barely acceptable mobility.

Illinois Eye and Ear Infirmary

Four Cutler mesh-type implants were used at this institution from March, 1948, to March, 1950. The results obtained in these four cases have been combined with those obtained with Stone-Jardon mesh implants and will be so reported.

Wilmer Institute

The results shown by the nine Cutler mesh-type implants inserted at the Wilmer Institute since October, 1948, have also been combined with those obtained from the Stone-Jardon implant and are so reported.

Stone-Jardon mesh implant

Cook County Hospital

Of the four Stone-Jardon implants placed at the Cook County Hospital, three were available for reëxamination. Two of these had already extruded, and the third, although having good mobility without exposed mesh or conjunctival overgrowth, showed severe secretion.

Veterans Administration Hospital Hines, Illinois*

In the series of Stone-Jardon implants studied at this hospital, there were 23 primary and seven secondary procedures. Of the 30 implantations, two have been removed and plastic spheres substituted. One, a primary, partially extruded four months after implantation, and being uncomfortable and unsightly, was removed. The other, a secondary implantation, was removed because it luxated postero-inferiorly and it was impossible to fit it with an anterior segment.

At the time of examination, the average age of these implants was eight months. Since no patient returned as instructed if he experienced any difficulty, the average age of these implants at the time this report was written was one year.

Motility was determined with the patient seated at the perimeter. The fixation light was then centered on the center of the pupil of the prosthesis. The patients were first checked "eyes front" to determine if an artificial tropia existed. If so, this was compensated for in calculating the final degree of motility. The patient first fixed the examiner's finger while in extreme gaze. The light reflex was then centered on the prosthetic pupil, and the motility in degrees was read off directly on the arm of the perimeter. Table 1 presents a comparison of the results obtained.

In the 22 cases of successful primary implantation, the greatest degree of motility was obtained in adduction and elevation, while the least motility was obtained in depression and abduction (table 1). The range of motility in all directions of gaze varied between 15 and 45 degrees. As compared

* Appreciation is expressed to Dr. Max M. Kulvin for his assistance in the preparation of this paper.

TABLE 1

COMPARISON OF MOTILITY IN DEGREES

	Adduction	Elevation	Depression	Abduction
Human	55	45	60	50
Primary				
Range	20–40	15–40	15–45	20–34
Average	32	31	28	25
Percent	58	69	47	50
Secondary				
Range	10–40	10–40	5–20	5–25
Average	20	21	13	10
Percent	34	46	21	20
Ball				
Range	10–25	10–25	10–20	5–20
Average	18	20	15	13
Percent	32	44	25	26
No Implant				
Range	10–15	5–25	5–15	3–15
Average	12	14	9	7
Percent	21	31	15	14

with the human eye, approximately 58 percent of maximum was achieved in adduction; elevation, 69 percent; depression, 47 percent; and abduction, 50 percent.

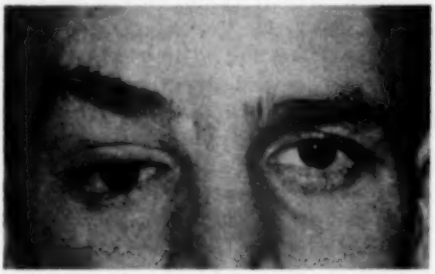

Fig. 2 (Drucker, et al.). Secondary implantation of Stone-Jardon implant, showing drooping of the lower lid.

Fig. 3 (Drucker, et al.). Secondary implantation of Stone-Jardon implant, showing sinking in of the upper lid.

With the seven secondary implants, the relative motility as to direction is approximately the same, with adduction and elevation again being the greatest and depression and abduction the least. However, there is a wide variance of results with a range of motility in all directions from five to 40 degrees. In only one case did the results approximate those of primary implants while, in the remainder, the motility varied from five to 15 degrees. As compared with the human eye, approximately 34 percent of maximum was achieved in adduction; elevation, 46 percent; depression, 21 percent; and abduction, 20 percent.

In the 18 cases with simple sphere implants, motility was greatest in adduction and elevation, least in depression and abduction. Motility in all directions varied from five to 20 degrees. As compared with the human eye, approximately 33 percent of maximum was achieved in adduction, 44 percent in elevation; 25 percent in depression; and 26 percent in adduction.

In the 10 cases with no implant, motility varied between five and 25 degrees in the various directions of gaze. Motility is again greatest in adduction and elevation and least in depression and abduction; however, here they more nearly approximate each other. As compared with the human eye, approximately 21 percent of maximum was achieved in adduction, 31 percent in elevation; 15 percent in depression; and 15 percent in abduction.

It is interesting to note that in these four groups, motility in adduction and elevation are the greatest, becoming more manifest in the cases without an implant.

The difference in motility obtained with the primary and secondary implants is quite marked, while the comparison of motility in secondary implants and ball implants shows a close similarity.

There is a noticeable difference in motility with no implant as compared with the secondary and ball implant. The motility in sockets without an implant showed the great-

est variation in movement from patient to patient.

In the orbits without implants in which the entire socket is filled with prosthesis in an attempt to maintain normal lid contour, the large prosthesis prevents full motion, and causes drooping of the lower lid and sinking in of the upper lid by its weight. In cases of secondary implantation of the Stone-Jardon implant (figs. 2 and 3) one can see that the drooping of the lower lid and sinking in of the upper lid is only partially corrected. In primary implantations, this has not occurred one year postoperatively (fig. 4).

Actually, comparison of motility of implants with that of the human eye is unfair for in the human eye more than one muscle is functioning in the various positions of gaze, while with the prosthesis, to all extents and purposes, only one muscle is functioning at a time. It is interesting to note that in a number of primary implantations, convergence was also quite excellent.

Of the 28 successful implants, eight, or 28 percent, had retraction of the conjunctiva from the neck of the implant with disclosure of the tantalum mesh. This conjunctival retraction varied from one to three mm. from the neck of the implant and three to 10 mm. in length. Five, or 18 percent of the cases, were associated with conjunctival overgrowth varying from one mm. in height and four mm. in length to three to four mm. in height about the entire neck of the implant. In only one case was there noted both conjunctival retraction and overgrowth.

It was noted, however, that there is a definite increase in mucoid secretion in association with retraction and overgrowth of the conjunctiva. This is probably due to the irritation from the bared tantalum mesh and the increased bulk and the position of the conjunctival overgrowth.

It is very interesting to note that in the eight cases of conjunctival retraction, six were superior; one superomedial; and one, superolateral. The greatest amount of retraction was also superiorly. In no case was there retraction of the conjunctiva from the neck of the implant inferiorly. In the one case of a primary implant which partially extruded and had to be removed, the conjunctival separation commenced superiorly and then extended medially with slipping off of the superior and medial rectus muscles (figs. 5 and 6).

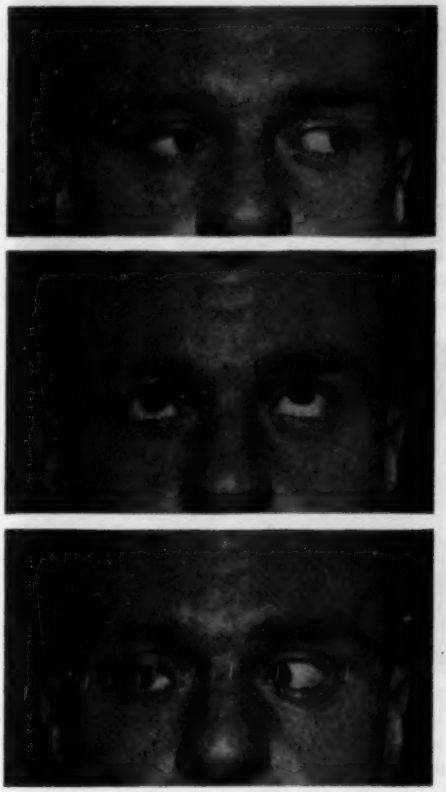

Fig. 4 (Drucker, et. al.). Primary implantation of Stone-Jardon implant, showing better cosmetic results.

Cutler[3] noted that extrusion of an implant began by exposure of a small segment of the ring, usually in the upper portion; then there was gradual extension of this defect, with eventual detachment of the muscles.

Cusick[4] paid considerable attention to overlapping the upper structures more ex-

Fig. 5 (Drucker, et al.). A Stone-Jardon implant which partially extruded and had to be removed.

Fig. 6 (Drucker, et al.). Same eye as in Figure 5, showing conjunctival separation.

tensively than the lower ones, thus providing a relatively thicker covering for the upper portion of the ring.

No more extrusions occurred in the remainder of this series.

As stated previously, two of the implants in this series have been removed, one of them a primary and the other a secondary implantation. What had been expected to be an easy procedure turned out to be an arduous task because the fibroblastic proliferation of Tenon's capsule and the retrobulbar fat were so great that the implant had to be removed by sharp dissection.

Even over the smooth posterior segment, which is without tantalum mesh, the tissue had to be scraped off in order to free the implant. In the areas where the conjunctiva was attached, it also had to be freed from the mesh by sharp dissection. However, in the areas of conjunctival retraction and muscle detachment, the tissue seemed to have lost its vitality and could be pried off more easily. Perhaps this was due to a low-grade infection and excessive mucoid secretion.

Treatment of conjunctival retraction is a real problem. In one case which was reoperated, the conjunctiva was undermined and returned to the neck of the implant, it subsequently retracted to its original position. It is also probable that the trauma during attempted repair of the retraction may further weaken the already deficient attachment of the tissue to the mesh, thus defeating the original purpose of surgery.

Conjunctival overgrowth represents another problem. The patients complain bitterly of the increased mucoid discharge associated with overgrowth, more so than that associated with conjunctival retraction.

In one case, I have excised a marked conjunctival overgrowth three times in the past 10 months. At the time of excision, the area was also cauterized. Recently, I excised the conjunctival overgrowth again, quite drastically, and did not cauterize it, feeling that cauterization was acting as a stimulant.

Several days later, another patient returned for examination following a radical excision of a conjunctival overgrowth. At this time there was no conjunctival overgrowth but rather conjunctival retraction superiorly. Now I am anxiously awaiting the return of the first patient.

Thus, one can see that there is a fine balance between recurrence of the conjunctival overgrowth and conjunctival retraction. One patient has stated that, for approximately one month after excision of the conjunctival overgrowth, the discharge is less and then gradually increases again as the overgrowth increases.

In general, patient reaction to the integrated implant was excellent. Most of them volunteered their approval and the fact that few of their friends realized that they were wearing a prosthetic eye. In only one case did the patient remove the anterior segment

at bed time. Several of them stated that they felt uncomfortable without the anterior segment in the orbit.

Most of the patients removed the anterior segment two to three times a day to irrigate the socket. In the case with marked conjunctival overgrowth, the anterior segment had to be removed and the socket irrigated six to eight times a day. None of the patients felt inconvenienced and, of the entire group, only one had not learned to remove the anterior segment and irrigate the socket.

The patient reaction to the ball implant was that of resignation and indifference with less complaint of discharge. However, a number of patients noted as much discharge as those with the integrated implants.

There have been no cases, as yet, of deep orbital cellulitis. One case of conjunctival infection following excessive irritation was found.

In general, quoting Guyton,[4] "Only long-term follow-ups can eliminate the possibilities of gradual late restriction of motility because of too heavy proliferation of fibrous tissue around the implants, or of late orbital infections because of lack of epithelization around the implant."

One can also add to this statement, only time will reveal the permanency of the integrated implant.

Illinois Eye and Ear Infirmary

Four Cutler "universal" and 31 Stone-Jardon mesh implants have been introduced since March, 1948. These implants are popular with our staff because the muscles and Tenon's capsule are easily attached to the mesh by means of 3-0 or 4-0 black-silk sutures. Only a few new type Stone-Jardon implants with the wider flanges on the anterior face have been used.

Among this group of 35 herein reviewed are two cases in which implants were inserted secondarily after loss of a Cutler ring implant and a Guyton plastic implant respectively. The former case failed again; the latter was in situ after three months and had good mobility. In one case, eviscero-enucleation was performed and a Cutler mesh implant was inserted behind a scleral cuff.

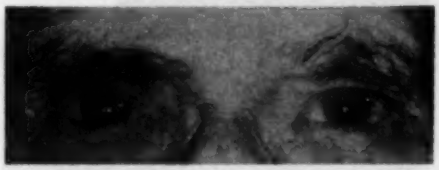

Fig. 7 (Drucker, et al.). Stone-Jardon implant in place after 18 months, showing an excellent cosmetic result with prosthesis inserted.

Six, or 17 percent, of the mesh-type implants have been lost. The loss of two could be attributed to poor tissue conditions—massive scarring after deep alkali burns and the case of secondary implantation already cited.

The other four were extruded or had to be removed because of poor muscular adherence to the mesh and/or moderately severe conjunctivitis and cellulitis. Our oldest retained mesh implant is 22 months. In general, the cosmetic appearance of these mesh implants is quite satisfactory (fig. 7).

In summary, 28 percent of the cases had abnormally narrow or widened palpebral fissures which could have been fully corrected by alterations in the prosthesis; 14 percent had sunken upper lids and the excursions of both implant and prosthesis were satisfactory.

The greatest difficulties consisted of a retraction of the conjunctiva from the "limbus" of the implant with exposure (fig. 8) of the mesh (31 percent), and troublesome conjunctival discharge (68 percent).

The conjunctival secretions could not be correlated with the degree of retraction of conjunctiva, duration of implantation, or bacterial flora. Cultures usually showed the presence of nonpathogenic organisms such as Staphylococcus albus and Xerosis bacillus.

Associated with this discharge, the conjunctiva was often congested and edematous (fig. 9) and would partially cover the face of the implant.

The difficulties at times associated with the mesh type implant were exemplified

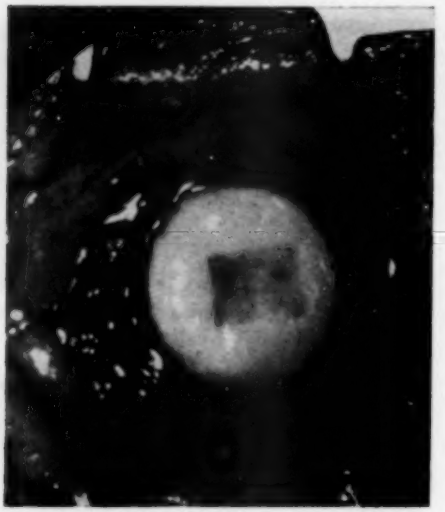

Fig. 8 (Drucker, et al.). Stone-Jardon implant in place after 18 months, showing conjunctival retraction and exposure of the implant mesh.

Fig. 9 (Drucker, et al.). Stone-Jardon implant in place after 17 months, showing conjunctival edema, injection, mucopurulent exudation, and conjunctival overgrowth.

strikingly in a healthy 19-year-old Negress in whom a Stone-Jardon implant was inserted at the time of enucleation in March, 1949. The postoperative course was uneventful and a prosthesis was fitted after a few weeks. Except for a small amount of mucopurulent discharge which was always present, the cosmetic and functional result was very satisfactory.

About six months after the enucleation, she developed a profuse mucopurulent discharge which did not respond to local treatment. The conjunctiva gradually receded and the wire mesh became sufficiently exposed to bare the attachment of the medial rectus.

Because of our discouraging experience in other such cases, we did not attempt to resuture the conjunctiva to the mesh. The patient became very discouraged because of the discomfort and constant secretions, and it was therefore decided to remove the implant and substitute a buried magnetic implant.

Wilmer Institute

Nine Cutler universal and eight Stone-Jardon acrylic and tantalum mesh type semiburied implants have been inserted at this institution since October, 1948. Nine of these were primary insertions at the time of enucleation, and eight were secondary to extruded Guyton exoplants. All of the primary insertions had been retained over follow-up periods of two to 12 months. Two of the secondary implants were removed because of orbital cellulitis. The remaining six secondary implantations had a two to 17 months' follow-up.

MAJOR COMPLICATIONS
(17 cases)

COMPLICATION	NUMBER	PERCENT
Extrusion	2	12
Orbital cellulitis	2	12
Hemorrhage (postop.)	0	0
Ruptured muscle	0	0
Exposed ring	4	24
Secondary operation	2	12

Only 10 cases had a follow-up period of four months or longer, the average follow-up being seven months. The cosmetic results in these 10 cases have been good.

COSMETIC RESULTS
(10 cases)

COMPLICATION	NUMBER	PERCENT
Straight in primary position	8	80
Deviated 10° or more	2	20
Abnormal lid fissure	2	20
Sunken eye	1	10
Subjective impression		
Excellent	7	70
Fair	2	20
Poor	1	10

Eight of the implants had normal lid fissures, good mobility, and were deviated less than 10 degrees in the primary position. Two had abnormal lid fissures and two were deviated more than 10 degrees in relation to the opposite eye in the primary position. One had a sunken upper lid.

The most troublesome complications were a tendency of the tantalum mesh to become exposed due to conjunctival retraction and the production of redundant granulation tissue. Several patients required secondary operations for these complications.

All of the patients have had conjunctival discharge ranging from slight to profuse. There has, however, been no evident correlation between exposure of the tantalum mesh or the amount of granulation tissue and the amount of conjunctival discharge.

MINOR COMPLICATIONS AND CARE
(10 cases)

COMPLICATION	NUMBER	PERCENT
Excision of granulations	4	40
Conjunctivitis requiring chemotherapy	2	20
Discharge		
Slight	6	60
Moderate	2	20
Profuse	2	20
Cleansing		
More than daily	4	40
Daily	6	60
Less than daily	0	0

BEARD MESH AND RING IMPLANT

Illinois Eye and Ear Infirmary

The Beard implant consists of a ring over which the muscles are sutured plus a mesh to which Tenon's capsule is attached. Only two such implants had been inserted at this institution at the time of this report. Both were in place after four and 12 months respectively. In the case observed after four months, there was excellent motility. There was also some conjunctival retraction with exposure of the mesh and a moderate mucopurulent discharge.

EXOPLANTS

Illinois Eye and Ear Infirmary

Since June, 1948, 23 Guyton exoplants have been inserted primarily at the time of enucleation and one has been inserted secondarily, three years after enucleation. Three of the primary implantations have been lost to date (1950). Two of the extrusions can be explained by an inadequate overlapping and suturing of the muscles, in one case because of extensive scarring around the superior rectus. The oldest retained exoplant is now 20 months.

Reëxamination of 14 cases showed a relatively high prevalence of abnormal palpebral

Fig. 10 (Drucker, et al.). Guyton exoplant in place after eight months, showing blepharoptosis and sinking with the prosthesis inserted. This condition developed after an earlier satisfactory prosthesis fitting.

Fig. 11 (Drucker, et al.). Guyton exoplant in place after seven months, showing implant in an unsatisfactory divergent and elevated position.

fissures (50 percent) and sunken upper lids (50 percent) (fig. 10). In only two of 14 cases were the exoplants directed straight ahead; the others were equally deviated laterally or vertically (fig. 11). However, movements of the prostheses and implants were only slightly less than those of other integrated implants. Conjunctival secretions and reactions were less than occurred with the mesh implants; however, they were sufficient to constitute an annoyance.

Wilmer Institute

Since July, 1946, a total of 105 exoplants have been inserted at the Wilmer Institute—89 were the original Guyton-type exoplant; five were the Friedenwald-Iliff modification;[3] eight were a recently modified Guyton type.

There were 76 exoplants inserted at the time of enucleation, and 29 were secondary or delayed insertions. Four exoplants were inserted after a Ruedemann acrylic eye implant was removed; eight were inserted or re-inserted following extrusion of a previous exoplant. Five exoplants were inserted in sockets which had buried glass, gold, vitallium-ball, or bone-sphere implants; four were in sockets in which no implantation had ever been performed. The period after enucleation in these delayed insertions ranged from six months to 15 years.

Of the primary exoplants, 17, or 22 percent, were extruded at an average time of 12 months after insertion; 11, or 40 percent, of the secondary exoplants were extruded at an average time of three and one-half months.

MAJOR COMPLICATIONS
(105 cases)

COMPLICATION	NUMBER	PERCENT
Extrusion	28	26
Orbital cellulitis	4	4
Hemorrhage (postop.)	1	1
Ruptured muscle	11	11
Secondary operation	12	12

Orbital cellulitis, occurring in four cases, resulted in extrusion in two.

In most cases of extrusion, the exposed portion of the exoplant gradually tilted downward, with stretching of the superior rectus muscle where it entered the tunnel above. Actual rupture of a muscle, usually the superior rectus, occurred in 11 cases.

The maximum follow-up period for a primary exoplant was 37 months, with an average follow-up of 19 months. For a secondary exoplant, the maximum follow-up period was 41 months, the average being 15 months. Of the 105 exoplants, 63 had a follow-up period of four months or longer, with sufficient data for tabulation of major and minor complications, care, and cosmetic results.

Of the 63 exoplants available for close follow-up, 36 (57 percent) had slight conjunctival discharge, 21 (33 percent) moderate, and six (10 percent) profuse.

MINOR COMPLICATIONS AND CARE
(63 cases)

COMPLICATION	NUMBER	PERCENT
Excision of granulation	2	3
Conjunctivitis requiring chemotherapy	9	14
Discharge		
Slight	36	57
Moderate	21	33
Profuse	6	10
Cleansing		
More than daily	24	38
Daily	36	57
Less than daily	3	5

The cosmetic effect was considered good in most of the 63 cases.

Of the primary insertions, 83 percent were deviated less than 10 degrees in the primary position, and this was true of 77

COSMETIC RESULTS
(63 cases)

COMPLICATION	NUMBER	PERCENT
Straight in primary position	49	78
Deviated 10° or more	14	22
Abnormal lid fissure	12	20
Sunken eye	7	11
Subjective impression		
Excellent	43	67
Fair	14	23
Poor	6	10

percent of the secondary exoplants. Mobility was generally good except in those cases with secondary exoplants, 24 percent of which had marked restriction of movement in one or more directions of gaze.

Abnormal lid fissures were encountered in 17 percent of the primary and 30 percent of the secondary exoplants. Sunken upper lids appeared in 11 percent of the primary and eight percent of the secondary exoplants.

RECENTLY MODIFIED EXOPLANTS

Wilmer Institute

From November, 1949, to April, 1950, a modified Guyton exoplant which utilizes the support of the oblique muscles to eliminate late tilting of the exoplant has been used in eight primary insertions and three secondary insertions. Only three of these cases have had a sufficient follow-up period to be included in this report. The statistics already given include these three cases.

The chief modification consists of an anteroposterior tunnel for attachment of the olique muscle in addition to the usual vertical and horizontal tunnels for the rectus muscles (fig. 12-A and B). Other modifications include a smaller anterior surface, a shorter anteroposterior length, a more flattened posterior segment, smaller tunnels, elimination of the vitallium cup in the anterior surface, and the use of a slotted rectangular hole with a vitallium pin to connect the prosthesis with the exoplant (fig. 13).

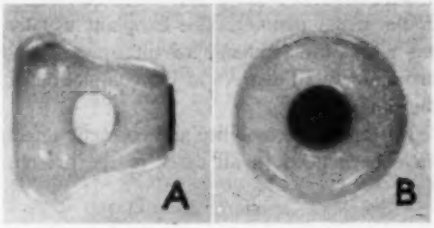

Fig. 12 (Drucker, et al.). The modified Guyton exoplant. (A) With the anteroposterior tunnel. (B) For attachment of the oblique muscles.

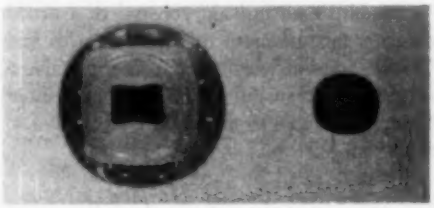

Fig. 13 (Drucker, et al.). The vitallium pin and slotted rectangular hole in the anterior face.

The new exoplant is in the shape of a truncated cone on a flattened hemispheric base. The anterior surface is 10 mm. and the base 16 mm. in diameter. The anteroposterior length is 16 mm. The two oval tunnels perpendicular to the anteroposterior axis are 4.0 mm. by 5.5 mm. in diameter and the anteroposterior tunnel is 5.5 mm. in diameter. The slotted receptacle for the vitallium pin in the anterior surface measures 5.0 mm. horizontally, 3.0 mm. vertically, and 3.0 mm. deep.

The technique for insertion of this exoplant is essentially the same as that used for the regular exoplant, except for the attachment of the oblique muscles. At the time of enucleation the oblique muscles are isolated and sutures are inserted in the same manner as described for the recti.

The inferior oblique muscle is passed through the posterior tunnel and attached to the superior oblique tendon which is brought through the superior portion of the vertical tunnel and out the posterior tunnel to be attached to the inferior oblique. The superior rectus is then attached to the inferior rectus and the internal rectus to the external rectus

in the usual manner. The exoplant usually has a definite tendency to tilt upward approximately 20 degrees at the completion of the operation.

Postoperative mobility and cosmetic effect have been good in all cases to the present date.

Buried implants

Hoffman type

The Hoffman implant consists of a broad anterior face of mesh to which muscles and Tenon's capsule are sutured. There is also a ring which transmits a rocking movement through Tenon's capsule and conjunctiva to the prosthesis.

Cook County Hospital

Six Hoffman buried implants have been inserted at the Cook County Hospital, and all six were available for follow-up. None were extruded or exposed; two had troublesome secretion. Mobility was cosmetically successful in only one case; three others, although untroubled, had reduced but acceptable mobility. In the remaining two cases, there was only slight or no motion.

Illinois Eye and Ear Infirmary

The large diameter of the ring of this type of implant makes adequate coverage of the implant difficult. In two of the four cases in which it was used at this institution, the wire mesh of the anterior face later became exposed. There was also a slight lag in the movements of the prosthesis, which is cosmetically undesirable.

Troutman magnetic implants

Cook County Hospital

Both patients with Troutman magnetic implants returned for reëxamination. One had troublesome secretion; the other patient showed a cosmetically successful result.

Illinois Eye and Ear Infirmary

Of the 20 Troutman magnetic implants placed at this hospital, one implant became turned 45 degrees nasally and the prosthesis moved poorly. Preliminary observations of a few of the other cases indicated that the sockets were cleaner and that the immediate movement of the prosthesis was excellent, thereby giving an excellent cosmetic result, although the maximal excursions were less than with integrated, nonburied implants.

Allen implant

Illinois Eye and Ear Infirmary

The Allen implant is more easily placed than other buried implants. Experience with this implant is, however, too limited to permit an analysis of the late results and of the appearance of the Allen implant with the permanent prosthesis in place.

TABLE 2

A comparison of the results obtained with the various implants used at Cook County Hospital

	Av. Time in Place	Successful	Acceptable	Unsatisfactory	Extruded	Total
Cutler ring	34 mo.	2	0	0	2	4
Cutler scleral	24 mo.	0	1	1	1	3
Cutler mesh	12 mo.	5	3	5	3	16
Modified Cutler mesh	6 mo.	0	1	2	0	3
Stone-Jardon mesh	9 mo.	0	0	1	2	3
Hoffman buried	15 mo.	1	3	2	0	6
Troutman magnetic	6 mo.	1	0	1	0	2
Total		9	8	12	8	37

Discussion

Cook County Hospital

Of the 56 mobile implants placed, 37 were available for reëxamination. Of these, nine were considered successful in all respects; eight were acceptable; 12 were unsatisfactory; and eight were extruded. Table 2 shows a comparison of the results obtained with the various implants used at this institution.

Veterans Administration Hospital

The study at this institution, limited to the results obtained with the Stone-Jardon mesh implant, brought out the following facts:

1. The degree of motility in the Stone-Jardon implant is greatest in elevation and adduction and therefore further research to equalize the efficiency of this implant is necessary.

2. Repair of conjunctival retraction is difficult and of questionable efficacy.

3. Overgrowth of conjunctiva does not tend to cause retraction of the conjunctiva nor does retraction of conjunctiva tend to cause conjunctival overgrowth.

4. Recurrences of conjunctival overgrowth are difficult to prevent without sacrificing the integrity of the implant.

5. Discharge from the socket is increased with conjunctival retraction and conjunctival overgrowth.

6. Secondary implantation in the hands of the average ophthalmic surgeon does not significantly improve motility and cosmetic appearance over that afforded by the ball implant.

7. Most conjunctival retractions and extrusions commence superiorly; therefore, it is necessary that the implant or surgical technique be altered to prevent this occurrence.

Illinois Eye and Ear Infirmary

An analysis of the results obtained with the Cutler ring, the mesh-type implants, and the Guyton exoplants yields the following data:

1. *Implant data.* Extrusions occurred most frequently in the Cutler ring implant, perhaps due to the wide excursions obtained with these implants and the corresponding tension and local necrosis of muscle tissue over the ring.

Inadequate dissection of the muscles and contracted sockets seemed to account for the loss of two Guyton implants. The high percentage of late deviations of the primary position of the Guyton exoplant is a serious drawback, although this can be corrected to some extent by changing the position of the peg in the prosthesis.

Irritation and possibly infection may have played a role in the loss of some wire mesh implants. Exposure of the mesh does not necessarily indicate approaching extrusion of the implant, but it is cosmetically undesirable, and may either produce or result from excessive conjunctival irritation and discharge.

2. *Conjunctival data.* Secretions and discharge are troublesome in all three implants, slightly more so in the mesh types. Antibiotics, sulfonamides, antiseptics, astringents, and lotions have all failed to reduce this problem materially.

Mechanical irritation by the prosthesis may be a major cause, especially if great care is not exercised in polishing the prosthesis. Removal of the prosthesis usually lessens the amount of exudation.

The implants can now be made without the use of monomer methyl methacrolate and thereby irritation and hypersensitivity reactions may be reduced.

3. *Prosthetic data.* Placement of the prostheses may be adjusted by changing the position of the peg and shape of the prosthesis. Hence, the data on the primary position is of interest in showing that, in the Guyton exoplant, a readjustment may be necessary if the exoplant "settles" unduly.

In one case, a mesh implant deviated so far laterally (about 40 degrees) that a grating noise audible to the patient was caused

by the prosthetic peg rubbing over the edges of the hole in the implant.

4. *Lid data.* Older techniques involving the implantation of completely buried spheres usually resulted in some degree of sinking-in of the upper lid. Guyton has emphasized that the weight of the prosthesis on the lower lid may cause a backward tilting of the upper portion of the prosthesis with retraction of the levator and upper lid fold. An undue vertical shortening of conjunctiva and Tenon's capsule by horizontal suture lines may also produce traction.

With these explanations in mind, it may well be expected that all the newer forms of buried implants may cause this cosmetic defect.

Also in our experience, the Guyton exoplants have shown more lid abnormalities than other integrated implants, perhaps because the prosthesis is not permanently supported in the proper position, or possibly because the conjunctiva and Tenon's are sutured farther posteriorly than in the case of mesh implants.

5. *Subjective impressions.* When the observer is critical of the imperfections of the present-day implants, he may lose sight of the fact that about 75 percent of patients are extremely happy over the appearance and movement of the prosthesis. Fitters of prostheses have commented on the fact that patients with ordinary glass-ball type implants become acutely aware of their inferiority when they compare their appearance with that of patients with integrated implants.

Most patients are willing to undergo the more complicated and expensive procedure, the greater difficulty in maintaining cleanliness, and the chance of an occasional extrusion of the integrated implant in order to obtain a better cosmetic result.

Following extrusion, little is lost except time and money, and secondary implantation, perhaps of the newer Troutman or Allen implants, can then be considered. The results observed thus far in our clinic indicate that the several difficulties herein enumerated remain to be rectified before the ideal implant is achieved.

Wilmer Institute

In this study, the exoplant was more extensively investigated than any other type implant. The results obtained are outlined in detail under the section on EXOPLANTS.

EDITOR'S SUMMARY

In spite of annoying but variable secretion in all cases, and in spite of other complications that result in spontaneous extrusion in a number of cases, or the necessity of its removal in others, the remark "that about 75 percent of patients are extremely happy over the appearance and movement of the prosthesis" is perfectly true. The other 25 percent of the patients can, however, be most disturbing to themselves and to their surgeons.

The studies here presented show that the idea of integrated orbital implants is sound, and also that further work along these lines should be continued. The problems of the complications are not insurmountable, but at the present time the surgeon must curb his enthusiasm and present to the patient a realistic and valid picture of what is ahead for him in the way of complications and possibilities. He is permitted to have some optimism in this matter.

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THE EFFECT OF SUNGLASSES IN PROTECTING RETINAL SENSITIVITY*

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INTRODUCTION

Due to the need of utmost efficiency during night lookout and sentry duty, the Armed Forces of the United States directed much attention to the problems of retinal sensitivity during World War II. It was learned that the effect of exposure to excessive sunlight would seriously decrease ability to see at night. At least two previous experimenters attacked this problem by studying the course and terminus of dark adaptation.

Hecht[1] reported, in 1948, that the effect of exposure to the illumination of the beach, without sunglasses, resulted in an increase in the absolute threshold for light, after dark adaptation, by a factor of 150 percent, thus showing that the rods of the retina lost some of their sensitivity.

Clark[2] reported, in 1946, that such loss of night sensitivity could be reduced or prevented by wearing dark (12-percent transmission) sunglasses during the day.

Peckham[3] described various means of preserving dark adaptation with sunglasses and red goggles in 1947. MacDonald,[4] in 1949, analyzed the various methods of measuring dark adaptation used in World War II.

These military efforts were concerned with dark adaptation and peripheral night vision. We are concerned with the other phase of this problem, civilian and military daylight cone vision with light adaptation. We ask these questions:

Does exposure to excessive light, as at the beach, affect visual efficiency during the day, or under artificial illumination at night?

If there is such an effect, in what units can it be measured?

If the effect can be measured, can it be prevented?

The response of the retina to brightness can be expressed graphically in Figure 1. Here we have plotted the hypothetical response (which could be visual acuity, contrast acuity, or brightness perception), as a function of the logarithm of the brightness. Figure 1 represents an idealization, and no specific units are used.

From Figure 1, we see that there will be a brightness so low that there will be no response, and one so great that there will be no increase in response. Near the center of the curve representing response, there will be a cusp at which point there is a transition from rod to cone vision.

The studies of Hecht and of Clark already referred to were concerned with the lowest point of this curve—that is, point A. The effect of increasing the absolute threshold is to move this point to the right on the scale.

Hecht,[5] in 1946, discusses the effect of anoxia on visual thresholds, and there points out that the effect is as if the curve, as a whole, were moved to the right, as shown by the dotted line.

This is, in effect, the same thing as saying that the reduction of retinal sensitivity is as if the light were dimmer, and thus we can express retinal sensitivity as a logarithmic decrement, or as an arithmetic ratio.

Loss of retinal sensitivity can be measured as a fraction of the effectiveness of a standard light, which will appear less dim to a less sensitive retina or as brighter to a more sensitive one.

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Although the decrement of the brightness is a constant horizontally, the decrement of retinal response varies vertically. At the point A, the shift in brightness, ΔB, is associated with a large shift in response, ΔR. At the point B, just above the rod-cone transition, the shift in response is not so great. At point C, which represents normal reading illumination, the shift of response for a fixed shift of brightness is hardly noticeable. At point D, at the levels of beach brightnesses, the shift in response can hardly be detected.

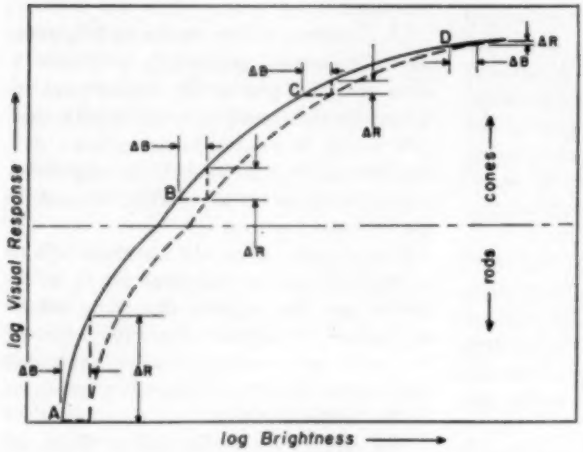

Fig. 1 (Peckham and Harley). A typical curve of retinal response is shown as a function of brightness. The figure indicates the effect of a constant increment (ΔB) of brightness upon the variable increment (ΔR) of response. As the brightness increases, the increment of response decreases. The point A represents the absolute threshold, the point B is just above the rod-cone transition. The point C represents reading illumination, and the point D represents beach brightnesses.

The easiest brightness to use to study retinal sensitivity would, therefore, be near the absolute threshold and, from the military viewpoint, this would also be the most important. However, the civilian population seldom if ever needs extreme dark vision, nor even much rod vision, since almost all visual tasks, including night driving, are accomplished with the aid of considerable artificial brightness. Our interest therefore lies in that portion of the response curve lying above the rod-cone transition.

Subject material

In order to discover the effect of excessive exposure to sunlight upon retinal sensitivity, arrangements were made to examine repeatedly a group of life guards from the Atlantic City Beach Patrol.* These men spend most of the day on the beach, under the shade of wooden stands, watching the beach population. The duty commences at the end of June and continues through the beginning of September.

The men range in age from 18 to 60 years, but the older men act in supervisory capacity, in buildings provided along the edge of the beach. Our studies were undertaken on an entirely voluntary group of these men, who received no recompense beyond a slight allowance for carfare during the studies of the second summer.

Experimental procedures and results

Two series of experiments were undertaken during the summers of 1948 and 1949. The first year's studies included measurements of visual acuity with low-contrast objects at low levels of illumination.

A test target was prepared in which small round dots appeared on a darker field. The size of the dots varied logarithmically. The

* Gratitude should be expressed to the civic leaders of Atlantic City, New Jersey, who made it possible to use these men for this study.

contrast of the dots ranged from 10 to 25 percent with respect to the background, and the sizes from the equivalent of 20/40 to 20/200.

The test was performed at 20 inches. The brightness of the background was 0.02 millilamberts. With this brightness and these sizes, macular vision is employed. Thus the tests were undertaken in the region of "B" on the retinal response curve in Figure 1. All measurements were made in the evening, after the completion of a day's beach duty. About 10 men could be examined in one evening.

The men, of whom 61 started and 26 completed the whole series, were divided into two groups, depending upon whether they stated that they wore sunglasses "always" or "usually," or stated that they wore them "seldom" or "never." The results of these measurements are shown in Table 1.

Since the test was quite difficult and showed rather low reliability, the data are presented with respect to the median scores of both groups for the three sets of test periods. If either group was superior, this would appear as a disproportion in the double dichotomy, above or below the median, and wearing or not wearing sun glasses

The data taken in early July represent men examined after three to five days of exposure. In these first data, the men who used sunglasses are statistically superior to those who did not. The second series of measurements, made in the middle of August, show that this superiority has disappeared, as do those made at the end of the season.

From these data, we conclude that the use of their sunglasses protected the men at first, but that the protection was inadequate.

Since there had been no control on the selection of the sunglasses, these being provided by those men who themselves preferred to purchase and use them, a second series was undertaken the next summer on fewer men for whom sunglasses were specifically provided, or whose own sunglasses were measured. In this second series an attempt was made to provide a test of retinal sensitivity that was both more reliable and easier to perform.

The difficulty of obtaining quantitative results the first year lies in the general uncertainty of visual response near the rod-cone transition, at the point B in the curve of Figure 1. Responses near C or even D are more positive, subjectively, even though

TABLE 1

RESULTS OF LOW CONTRAST MEASUREMENTS DURING THE SUMMER OF 1948

	Cases Below Median	Cases Above Median	Probability (%)	Statistical Interpretation
		Series One, Early July, 61 cases		
A&U*	8	16		
S&N†	23	14	1.4	Certainly different
		Series Two, Mid-August, 50 cases		
A&U	14	13		
S&N	12	11	47.6	Identical
		Series Three, Early September, 26 cases		
A&U	6	5		
S&N	6	9	23.6	Chance association

* A&U = wearers of sunglasses always or usually.
† S&N = wearers of sunglasses seldom or never.
The probability of chance association was determined from Chi-squared.

differentials due to brightness are smaller.

If some retinal function in which the increment of response is linear with respect to the increment of the logarithm of the brightness can be found, such a function would be easier to measure. This is true of the critical flicker frequency.

Flicker is that peculiar visual response to stimulus of alternating brightness. As the alternation of brightness increases from one per second to about 60 per second, the subject sees, first, an alternation of light, then a quivering and scintillating lighted area that is quite unpleasant, until the rate of flicker is sufficiently rapid that the light appears homogeneous and constant.

The transition from scintillation to constancy is quite abrupt, and this rate of alternation is termed the critical flicker frequency. This rate depends upon the brightness of the light, the contrast of the two brightnesses that are alternated, and the relative duration of the lighter and darker portions of a cycle of alternation.

Studies of the phenomena of flicker have been frequently made, the most recent and complete being, perhaps, those of Hecht,[6] in 1936, and Crozier and Wolf,[7] in 1941. The relationship between flicker rate and brightness is shown in Figure 2.

In Figure 2, the solid line represents the relationship between critical flicker frequency and the logarithm of the brightness for a typical observer. Suppose for the standard brightness, B_1, an observer finds the critical flicker frequency, or transition between flicker and constant light, at the rate R_1. If the light were dimmer, he would have reported a different and slower critical flicker frequency, at, say, R_2. Both the decrements, ΔF of flicker rate or ΔB of brightness, could be measured.

Now suppose another observer, indicated by the broken line, is exposed to the same flickering source. He might report the cessation of flicker, or critical flicker frequency, at a different rate, say at R_2, for the standard brightness B_1. He has responded to B_1 as the first subject responded to B_2. In effect, therefore, B_1 provided less retinal stimulation to the second subject than it provided to the first.

The ratio of B_1 to B_2, or B_1/B_2, represents the difference in retinal sensitivity be-

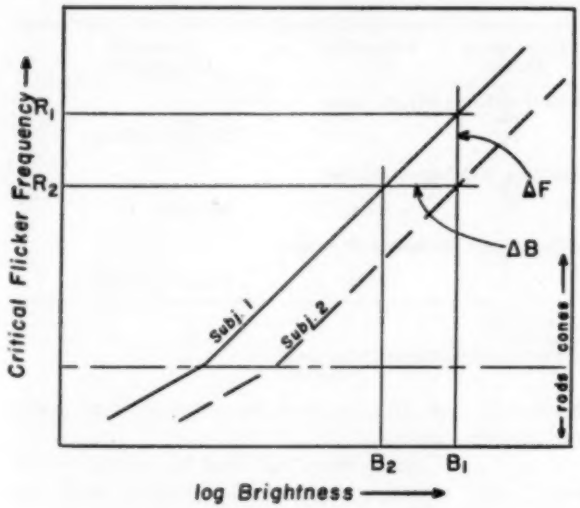

Fig. 2 (Peckham and Harley). The critical flicker frequency (CFF) for two subjects of different retinal sensitivity is expressed as a function of brightness. If B_1 represents a standard brightness, Subject 1 reports the critical disappearance of flicker at the rate R_1. Subject 2 reports the rate R_2 for the standard brightness B_1. This is the rate Subject 1 would have reported for the lower brightness B_2. Hence ΔB in indicative of the difference in retinal sensitivity between the two subjects, and can be predicted by determining ΔF. When the CFF is known, it can be shown that the effective brightness B of the standard flickering light is expressed by the function:

$$\log_{10} B = (CFF - 30)/10$$

when B_1 equals 1.0 millilambert.

tween these subjects. (The argument holds whether flicker is considered a retinal phenomenon or a cerebral phenomenon, since, in this latter hypothesis, we would be measuring visual response as affected by exposure to sunlight, which is essentially the same problem.)

But since B_1 and B_2 are represented in the diagram by their logarithms, the linear difference between B_1 and B_2, or ΔB represents this ratio, and retinal sensitivity (or visual response) can be measured linearly as a logarithmic unit.

This method of establishing quantitative differences between subjects is especially applicable to our problem, since, by holding the brightness of the flickering light constant, we can measure directly the relative differences between subjects without being concerned with any absolute value of either retinal or visual sensitivity.

Furthermore, since we are more concerned with the change in sensitivity than with the relative degree of sensitivity, we can measure by this means any shifts in sensitivity that occur between evening and morning, or before and after exposure to excessive sunlight.

In the studies undertaken during the second summer (1949), more complete data were taken on a smaller group of exclusively young men, from 18 to 25 years of age. All of these men were in excellent health, and had normal visual acuity, with glasses in two cases. The two subjects who used glasses had provided themselves with greenish prescription sunglasses, of 35 percent to 50 percent transmission. (The transmission depends upon the thickness of the glass, which is variable according to the prescription.)

A total of 35 men were selected from the volunteers, of whom only 21 completed all of the examination sessions. These men were divided into three groups, a group of six men who wore no sunglasses, a group of five men (two prescriptions) who wore glasses of commercially available density (35 to 50 percent), and a group of 10 men wearing dense glasses especially prepared to our specifications (10 to 12 percent).

All the sunglasses were ground and polished to six-base curve, and were mounted in comfortable and individually adjusted frames of ophthalmic quality. The lenses were approximately 50 by 45 mm., of drop oval shape.

The glass used for the lighter shade was greenish in color, and absorbed ultraviolet and infrared light. The glass used in the darker shade was either neutral gray or bluish gray in color, and absorbed ultraviolet and infrared light. (Five pairs each, of gray and bluish gray glasses were used. No differences in the effect of these colors were noticeable in the results.)

Incidentally, Judd[8] has pointed out recently that the macula is "protected against overstimulation by short-wave radiation," that is, violet and ultraviolet, by virtue of the absorptions of the cornea, lens, aqueous and vitreous humors, and the pigment of the macula lutea. Since the optical path of the eye is through tissue mostly composed of water, infrared radiation is also strongly absorbed.

The flicker apparatus was prepared by using a commercially available stroboscope,[9] mounted in a box with a two cm. hole at a distance of 25 cm. from the stroboscope lamp. The hole was covered with an opal glass and a red (Wratten #25) filter.

The apparatus was provided with a brow rest permitting observation of this illuminated area at 30 cm. The stimulus was therefore perimacular and limited to cone vision. The brightness of the area, above critical flicker frequency, was equivalent to about 1.0 millilambert.

The rate of flicker was controlled by two knobs, one for the subject, which was operated with a slipping clutch, and one for the operator, directly coupled to the stroboscope. In making measurements for every session, the subject was partially dark-adapted (five min. to 0.1 millilambert) and allowed to practice selecting the critical

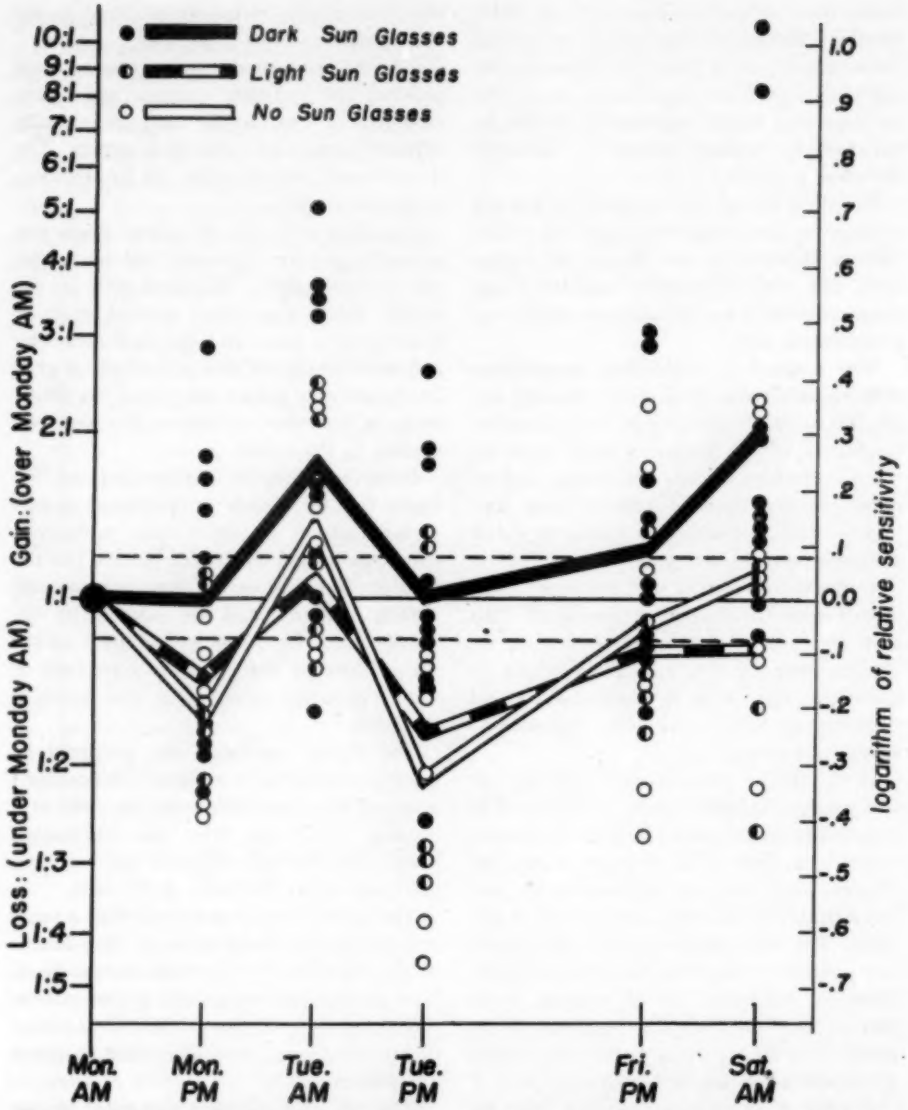

Fig. 3 (Peckham and Harley). The effect of wearing adequate sunglasses for a week at the beach is shown by the changes in retinal sensitivity relative to the morning of the first day. The individual records are shown as circles, and the group averages are shown as lines. The greatest difference in individual records is found to be a ratio of 12:1 on the evening of the second day. The darker sunglasses show a general net gain of about 2:1 over either lighter sunglasses or no sunglasses, at the end of a week. The two broken lines at ± 0.08 log units represent one standard deviation from the average individual instrument settings, and express the statistical reliability of these data.

flicker frequency by increasing the rate from near 12 per second to the cessation of the flicker.

Between settings the operator reduced the rate to a random value between six and 12 per second, by turning his control, and causing the subject's control to slip. No records were noted until after at least two trials, or until the subject was giving consistent results. For each session 10 values were recorded and averaged.

The men of the Beach Patrol reported for assignment to duty on a Sunday afternoon, either June 19th or July 3rd. That same evening they were assembled for flicker measurements and completely instructed in the use of the apparatus, and were provided with sunglasses and instructions as to their continuous wear, if they were to wear sunglasses. Continuous wear was defined as at all times in the daylight, from sunrise to sunset, except when actually in the water or making a rescue.

Six sessions of measurements were undertaken, Monday morning and evening, Tuesday morning and evening, Friday evening and Saturday morning. Examinations were carried out in the ophthalmic office of one of us (R. D. H.) from 6:30 to 7:30 in the mornings, and from 6:30 to 7:30 in the evenings. Great appreciation should be expressed to those of the volunteers who succeeded in meeting all of these rather difficult appointment hours.

The results were obtained in terms of critical flicker frequency rates per minute, were changed to critical flicker frequency per second, and then to logarithmic values of brightness, using Figure 2 and assuming the slope of the line to be 10 cycles per second per logarithmic unit to the base 10. As an arbitrary origin, the point 40 cycles per second, 1.0 log B (10 millilamberts) was assigned.

Since these results included the variance of the critical flicker frequency for all the subjects, expressed in relative units, they were further reduced to difference (gain or loss) from the value of the critical flicker frequency for each particular subject on Monday morning.

The values expressed in Figure 3, therefore, represent changes in retinal sensitivity with respect to Monday morning, the first day of the first week of Beach Patrol duty. The individual records of each of the 21 subjects are plotted in appropriate shadings.

The average deviations of each of the subjects from Monday mornings, for the three groups, are expressed as lines. The relative sensivity to brightness of these subjects, with respect to Monday morning, are shown as logarithmic units on the ordinates on the right of the diagram. The ordinates on the left of the diagram represent the ratios in arithmetic units, as loss or gain with respect to Monday morning.

Great individual variation is obvious from this figure. Between the best and poorest values, after exposure all day Monday as shown for Monday evening, we find a range from 3:1 to 1:2, or more than a six to one difference between subjects.

The greatest range on the figure is found between one subject on Tuesday evening, whose sensitivity was one fifth that shown Monday morning, and one subject on Saturday morning, whose sensitivity was 10 times that shown Monday morning. This is a difference between the effectiveness of a standard brightness of 50 times between these two instances. It should be noticed that the Tuesday-evening guard wore no sunglasses, and the Saturday-morning guard wore dense sunglasses.

The trends of the group, shown by lines in Figure 1, are quite enlightening. Those in the group wearing dark glasses are, as an average, consistently improved with respect to Monday morning, although they were exposed to the excessive beach light for 10 to 12 hours each day. (The over-all brightness of the beach was measured to be from 8,000 to 20,000 millilamberts, depending upon the time of the day and the weather.)

The trends of the two other groups are nearly parallel to each other, showing during each night a recovery of the day's loss,

but showing toward the end of the first day a lag of 0.25 to 0.3 logarithmic units below the record of the group wearing darker glasses. This is a loss in the ratio of 1.8 to 2.0 times, or nearly 50 percent of the effective brightness of the available illumination.

It is very interesting to note that the lighter sunglasses were not effective in preventing this loss, since those wearing the lighter glasses are not superior to those wearing no sunglasses.

Since it is the practice to enlist the Beach Patrol from residents of Atlantic City, these guards were all exposed to some considerable sunlight previous to our experiment. That this previous exposure caused a loss is evidenced by the increase in retinal sensitivity exhibited by the group wearing dark glasses, whereas the other two groups maintained approximately the same average from one end of the experimental week to the other.

It would have been interesting to obtain records at the end of a month, and an unsuccessful attempt was made to do so. However, the effort of such early and late hours must have been too great. An insufficient number of the men appeared for these later sessions for any valid conclusions.

Reliability of the data

Individual data, at a given session, were remarkably consistent for that session. From session to session the variation was usually quite great, as can be deduced from Figure 3.

The reason for this variation became apparent from the examination of the working conditions. The men were assigned various areas of the beaches to guard. On some days the traffic was very heavy at all beaches, as on holidays and week ends. On other days the beaches might be almost deserted most of the time, with the great exception that at various specific places group picnics are quite common, lasting from before noon to late afternoon.

At these picnic beaches, the effort required of the guards and, consequently, the amount of exposure of the eyes, was greatly increased by virtue of the need for especial watchfulness over a party consisting largely of children and, frequently, irresponsible adults. Thus, although the exposure of all the experimental subjects was consistently excessive, some men bore heavier burdens on such days.

As a measure of the reliability of the data for individual sessions, the standard deviation from the average for each of the sets of 10 readings has been computed. This amounts to 0.08 logarithmic units, and is so illustrated in Figure 3 by the two broken horizontal lines. Differences between the lines for the average sensitivity should be as great as the separation of these lines to be considered statistically reliable.

Conclusions

The following conclusions are drawn from these experimental data.

1. The wearing of sunglasses of commercial density (35 to 50 percent) will supply some protection to retinal sensitivity for short periods, say of one day or less, against the excessive sunlight at the beach.

2. The wearing of sunglasses of commercial density (35 to 50 percent) will not suffice to provide protection from exposure to such excessive sunlight for periods of a week or more.

3. The wearing of darker sunglasses (10 to 12 percent) will provide protection from exposure to excessive sunlight for periods as long as a week or more. (Such sunglasses are commercially available, but are in the minority.)

4. Failure to wear sunglasses will result in loss of retinal sensitivity caused by exposure to excessive sunlight. This loss, on an average, is about 1:2, or 50 percent. In the extreme cases, the loss can amount to more than 1:10, or 90 percent.

5. Loss of retinal sensitivity can be

demonstrated, and can be assessed, as a reduction of the effectiveness of available ambient photopic (cone) illumination.

6. Since both the lighter and darker sunglasses effectively absorbed ultraviolet and infrared light, these extravisual rays cannot be considered the cause of the loss of retinal sensitivity resultant from exposure to excessive sunlight. The causative factor is the visible portion of the solar radiation, probably effective through the extreme light adaptation that becomes manifest after exposure to excessive illumination.

7. Subsequent dark adaptation, even to moderate photopic (cone) illumination is delayed for a period of days or weeks after such exposure (Hecht[1]).

Discussion

The loss of retinal sensitivity or the reduction of the visual response to light stimulus, after excessive exposure to bright light without the protection of sunglasses, can be a causative factor of both industrial and automobile accidents, especially in working under conditions of minimal illumination and in driving at night.

Since this loss may amount to a reduction of light to one half of its photometric value, and in many cases more than this, the illumination of industrial and clerical working areas can easily become seriously insufficient. Since the effect is most noticeable immediately after the exposure, night driving to one's residence after a day at the beach can be particularly dangerous, if no sunglasses are worn.

Similarly, significant effects can be expected in any undertaking when the illumination is minimal or inadequate. For example, the reduction of the effective brightness of fluoroscopic images for even small amounts is a serious detriment to a radiologist. When fluoroscopy is being extensively practiced, continuous use of sunglasses of high density should be considered essential.

The problem of obtaining a sufficiently dark pair of sunglasses is acute. A few are available in the market, both in ground and polished form, and in the much less expensive coquille form. These latter have been shown not to affect visual acuity and can be recommended if they are dark enough.[10]

The conclusion would seem to be "the darker the better," and it is suggested, as a pragmatic test, that if the wearer's eyes can be seen behind the lenses, the lenses are probably not dark enough.

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TARSITIS AS A CAUSE OF SULFONAMIDE RESISTANCE IN TRACHOMA*

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The first report of the use of the sulfonamide compounds in trachoma was made by Heinemann, in 1937, although Loe published, in 1938, studies reported in 1937. Since then a large number of communications have appeared in the literature and most of the authors, including Thygeson, have found these compounds to be highly efficacious.

In the course of several years' work in a trachoma hospital in Turkey, I treated some 500 patients with sulfanilamide. Three gm. daily were administered orally in three equal doses, with equivalent quantities of sodium bicarbonate, for treatment periods varying from 10 to 70 days. No other form of treatment was given during the period.

Irrespective of the type or severity of the trachoma, virtually all patients showed improvement with respect to the subjective symptoms; that is, their photophobia was minimized, there was less secretion and lacrimation, and they felt more comfortable generally. At the termination of the treatment period, however, only 10 percent of the patients were wholly asymptomatic, with the disease arrested; 45 percent were definitely improved but still clinically active; and 45 percent were fundamentally unchanged. In other words, roughly half the series profited from the administration of sulfanilamide while the other half did not.

In view of the inconsistency of these results, attempts were made subsequently at Istanbul University to determine possible causes for the success or failure of this form of treatment. For the purposes of these studies a series of 38 selected cases of trachoma was divided into three groups according to the degree of involvement of the tarsus.

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Clinical study

Group I consisted of five patients in whom the infection was limited essentially to the tarsal conjunctiva, in the form of follicular hypertrophy or papillary hypertrophy, or both, and in whom there was no gross evidence of involvement of the cornea and tarsus.

Group II consisted of 21 patients with varying degrees of lid and corneal involvement and showing marked thickening of the tarsus.

Group III consisted of 12 patients with massive corneal disease and little or no conjunctival involvement but with the tarsus either scarred or atrophied.

In other respects the series was unselected. There were 14 males and 24 females, the ages varied from seven to 60 years, and the duration of symptoms ranged from a few months to over 20 years. Several patients had been subjected previously to extensive and varied courses of treatment.

Results

Group I (five cases)

Case 1. An 18-year-old boy was treated for 13 days with 39 gm. sulfanilamide. A conjunctival lesion and beginning pannus healed completely. The palpebral conjunctiva became free from congestion and showed normal vessels.

Case 2. A 15-year-old girl was treated for 40 days with 75 gm. sulfanilamide. The treatment was supplemented by a grattage operation on the 20th day. The conjunctival and corneal lesions healed completely.

Case 3. A 16-year-old boy was treated for 70 days with 80 gm. sulfanilamide, with complete healing.

Cases 4 and 5. Sulfonamide treatment was supplemented by grattage operation. The result was complete healing.

GROUP II (21 cases)

In this group the conjunctival lesions were improved in seven cases but remained approximately the same in 14. On the other hand, the corneal lesions in the 12 cases in which they were strictly trachomatous—that is, pannus or trachomatous keratitis—cleared up completely. In the other nine cases, the corneal lesions—abscesses—involved deeper layers of the cornea, and were probably not related to trachoma virus. Six of these cases healed after long treatment which left dense scars and empty vessels in the corneal substantia propria, but three remained unchanged.

GROUP III (12 cases)

In this group, in which the cornea was involved, the conjunctiva minimally or not at all involved, and the tarsus scarred or atrophied, the disease was completely arrested in eight cases after from 10 to 15 days' treatment and was considerably improved in three days. Only one case in this group remained unchanged.

DISCUSSION

The results of this study would seem to indicate that the efficacy of the sulfonamide drugs in trachoma depends largely on the degree to which the tarsus is involved. In the first group, in which the tarsus was not yet clinically involved, and in the third group, in which it was scarred or atrophied, the curative effects were clearly positive. But in the second group, in which the tarsus was definitely involved, marked improvement was obtained in the corneal lesions but the conjunctival condition remained unchanged.

Trachoma is a tarsitis as well as a keratoconjunctivitis, and it is surprising to note that, in the early stage, as a result of the inflammatory process, retention cysts appear in Krause's glands and in the meibomian glands (Wilson). The tarsus in the early stage of the disease is thickened as a result of a rich cellular infiltration of round cells and mast cells which may penetrate deeply into it, finding their way along the blood vessels, particularly in relation to the upper and lower arterial arches (Duke-Elder). The finding of a true follicle in the tarsus by Raehlmann has not been confirmed. The infiltration is diffuse although there may be definite aggregations of cells. The subsequent degeneration and softening lead to deformation—a primary affection of the tarsus rather than a mechanical deformation secondary to contraction of the mucous membrane.

The tarsal glands are invariably affected, partly from atrophy and partly from strangulation, first by the dense infiltration and later by scar tissue. The acini degenerate into cystic spaces and the lining epithelium degenerates, sometimes to be replaced by many layers of cells, and there may be hyaline and fatty degeneration. Duke-Elder suggests that the virus may linger here for a considerable time, constituting a reservoir from which reinfection may take place.

It is important to note that in the neighborhood of the acini of those meibomian glands which are undergoing destruction, there may be foci of dense infiltration consisting of lymphocytes, plasma cells, and occasional polymorphonuclear leukocytes. These foci strongly resemble the foci of infiltration in subepithelial tissue. In most cases there seems to be no connection between the intratarsal foci and the foci in the tarsal conjunctiva (Birch-Hirschfeld).

Lowenstein studied excised trachomatous tarsal plates histopathologically. He considered that the virus might reach the subepithelial tissues and that the development of fibrous tissue might lead to the deep storage of infective material. He concluded that this might account for the frequent relapses in cases of long-standing trachoma and that it constituted a justification for the excision of the tarsal plate in such cases.

Thygeson vigorously protested these conclusions of Lowenstein. He pointed out that the virus had never been demonstrated in the subepithelial tissues and referred to the

well-established fact that epithelial scrapings are much more infective than expressed follicular material. He cited also the fact that inoculation of human volunteers and monkeys by placing material subepithelially through the skin of the lid has never resulted in infection, whereas many positive results have been obtained when the epithelial surface itself has been inoculated with the same material. He felt that the subepithelial changes of trachoma were most likely due to a soluble toxin secreted by the virus, comparable to the toxins produced by the other members of the psittacosis-lymphogranuloma venereum group of viruses.

In his recent paper Wilson also refers to this concept of the "destructive toxins which are evidently present" in this disease. Professor Mitsui and his collaborators in Japan also failed to produce trachoma by the experimental inoculation of tarsal material. The authors undertook the experimental transfer of the tarsal portion of the upper lid which was obtained by the Holtz method from entropion operation cases. The negative results may have been due to tarsal cicatrization, however; in this stage of trachoma it is very difficult to demonstrate the etiologic agent even in conjunctival epithelial scrapings.

In my opinion, the toxin theory is not applicable to trachomatous tarsitis, especially to the type in which the meibomian glands are heavily involved, for the following reasons: (1) The epithelial cells of the tarsal glands could conceivably be involved by the virus as much as the epithelial cells of the bulbar, tarsal, and limbal conjunctiva and of the lacrimal sac. (2) I have seen many cases with severe trachoma which failed to respond to any kind of therapy but were cured by excision of the tarsus. (3) I never have seen any case of trachoma stage IV without atrophy of the tarsus. (4) Trachomatous tarsitis fails to respond to any of the medical treatments which arrest the conjunctival and corneal lesions.

Conclusions

From the point of view of treatment, trachoma may be divided into two groups: (1) Trachoma without tarsitis and (2) trachoma with tarsitis. The first group responds to sulfonamide therapy. The second group fails to respond to any kind of medical treatment.

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TUMOR OF THE LACRIMAL GLAND*

Report of four cases

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Two types of primary tumors of the lacrimal gland are known: mixed tumors and adenocarcinoma of the alveolar type. The first is more common. "Only a few cases of proved adenocarcinoma of the orbit of all types have been reported; and many features pertaining to the development and clinical reaction to the treatment are not well understood." (Benedict.[1])

We have observed and treated two cases of tumor of the lacrimal gland. The other two cases, reported herein and seen by Dr. Boyce and Dr. Ellis, and one of ours comprise the only known cases of adenocarcinoma of the lacrimal gland observed in Los Angeles for the last 20 years.

Report of cases

Case 1

History. Mrs. M. K. M., aged 60 years, first seen by us on August 16, 1944, gave the following history:

About 14 years previously she noticed her left eye becoming prominent. For a time she had vertical diplopia. The left eye gradually became more prominent and displaced downward. Her vision, always poorer in that eye, decreased.

Eye examination. The most prominent part of the cornea was 15 mm. in front of the plane passing tangentially to the upper orbital margin. Because of displacement of the eyeball downward, the left pupil was 20 mm. lower than the right. The globe was lying upon the cheek.

When the eyes were in the primary position, the upper lid covered the uppermost segment of the cornea, and the lower part of the globe remained exposed. Exophthalmometric reading was: R.E., 16 mm.; L.E., 36 mm.

The cornea was normal. The eye movements were free except for a moderate limitation when looking up and out. A tumor mass was felt in the outer part of the orbit above the globe. It was not adherent to the skin or to the orbital bones, and was somewhat movable. The fundi were not remarkable.

Vision was: R.E., 20/20; L.E., with pinhole disc, 20/50. X-ray studies of the orbit did not reveal erosion of the bone.

Diagnosis was tumor of the lacrimal gland.

Operative procedure. On December 21, 1944, the tumor was removed under general anesthesia. An incision was made through the eyebrow to the outer angle of the orbit down to the periosteum. The latter was elevated and the bluish lobulated mass was exposed to view under the septum of the orbit. The septum was incised and the tumor was removed in capsule. The tumor extended back to the apex of the orbit but was entirely outside of the muscle cone (fig. 1).

Pathologic report. The tumor is encapsulated, slightly nodular in appearance, and yellowish in color. In cross section there is a smooth homogeneous yellowish cut surface with several cystic areas filled with blood clot.

Microscopic examination. The numerous sections examined show a small number of normal acini which are lined with one or two layers of cuboidal cells.

The bulk of the tumor is composed of almost acellular fibers and of eipthelial cells which are aggregated either in cords or in masses. These cells possess an oval nucleus and scanty cytoplasm.

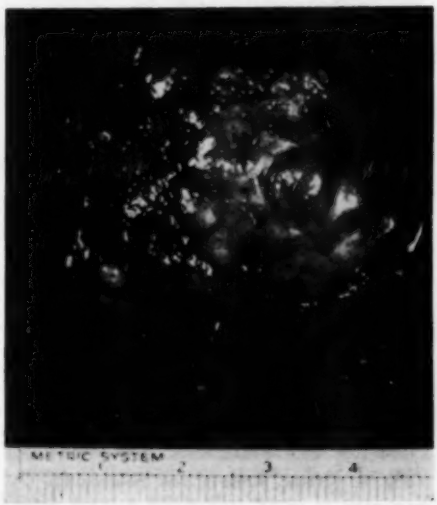

Fig. 1 (Irvine, Roberts, and Soudakoff). *Case 1.* General view of the tumor.

* From the Department of Ophthalmology, University of Southern California and the Eye Laboratory, Estelle Doheny Eye Foundation.

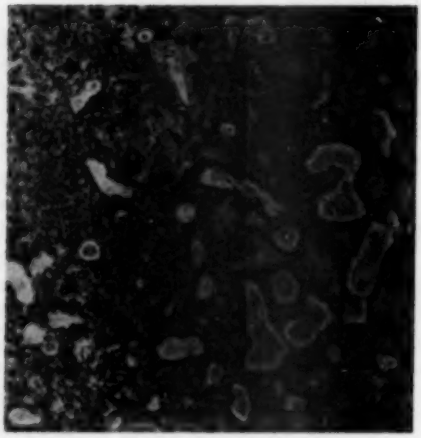

Fig. 2 (Irvine, Roberts, and Soudakoff). *Case 1.* Acini and ductlike formations within the tumor mass.

In the cellular portion of the tumor there are numerous empty spaces of various sizes. They are lined by tumor cells, thus taking on the aspect of acini and ducti (fig. 2).

Large spaces are filled with blood or with mucinlike substance. They correspond to the cystic areas seen macroscopically. Some of ductilike spaces contain islands of epithelial cells which have lost their nuclei and the cytoplasm of which is increased two to three times in volume (fig. 3-A).

The stroma of the tumor consists of homogeneous fibrillar tissue, mucoid in appearance, which at some places assumed the appearance of cartilaginous tissue (fig. 3-B). Few nests of keratinization of tumor cells are noted (fig. 3-C).

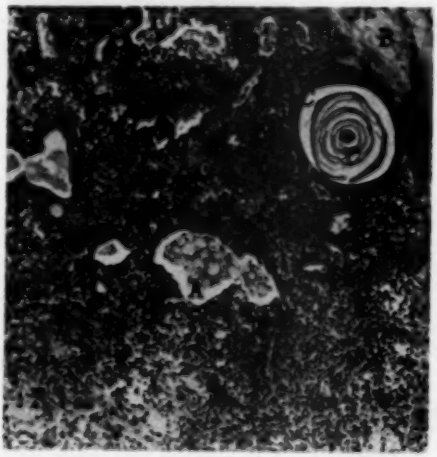

Fig. 3. (Irvine, Roberts, and Soudakoff). (A) Metaplasia of tumor cells within a newly formed lacuna. (B) Cartilagelike tissue. (C) Keratinization of tumor cells.

Opinion. Mixed tumor of the lacrimal gland.

Course. The patient was last seen on August 11, 1950. There was no sign of recurrence of tumor. Vision was: R.E., 20/20; L.E., 20/30.

Exophthalmometric reading: R.E., 15 mm.; L.E., 18 mm. Muscle balance: orthophoria.

CASE 2

History. W. Y. H., a Chinese man, aged 36 years, was admitted to the Peking Union Medical College Hospital, Peking, on April 6, 1931, for a tumor growth in the left orbit of three years' duration. The tumor was removed and reported to be cylindroma of the orbit. Six months later the patient was readmitted because of recurrence of the orbital tumor.

Eye examination. The left eye protruded forward and deviated downward and inward.

Exophthalmometric reading was: R.E., 17 mm.; L.E., 26 mm.

Vision was: R.E., 6/5; L.E., 6/6.

Total extirpation of the tumor was done through the orbital approach. The tumor measured 10 mm. by 44 mm.

Microscopic examination. The specimen is a section through the tumor mass. There is normal lacrimal gland, lobules of which contain numerous acini lined with one layer of cuboidal cells.

At the periphery of the gland, the acini become confluent and are lined by multiple layers of epithelial cells. Still farther from normal gland, anastomosing cords or broad masses of epithelial cells, which enclose numerous spaces filled with mucus, are seen. Masses of tumor cells are either in close contact with the normal acini or are separated from them by strands of connective tissue.

The tumor cells are round or oval in shape with a large nucleus. The connective tissue has undergone mucous and hyaline degeneration. The tumor is surrounded by a capsule composed of connective tissue fibers.

Opinion. Cylindroma of the lacrimal gland (figs. 4 and 5).

Treatment. In view of malignancy of the tumor, radium was applied at the upper orbital margin once a week for four consecutive weeks. Altogether 153 mc. of gamma rays were given. At the end of this treatment there was no palpable mass in the orbit. Supplementary X-ray therapy (2,440 r) was administered in 10 sittings.

The patient returned on June 19, 1934, for recurrence of the tumor complicated by paralysis of the trigeminal nerve. The left eye showed hyperpigmentation of the lids, partial ptosis of the upper lid, and proptosis of the eyeball. There was a corneal ulcer with iris prolapse in the exposed area. Preauricular and submaxillary glands were palpable. Exophthalmometric reading was not recorded.

Radon seeds were inserted into the eyeball, into

temporal and submaxillary glands, and also along the left sternomastoid muscle. A total of 8,608 mc. were given. Six weeks later, exenteration of the orbit was performed. The orbit and the left cervical and submaxillary regions were irradiated with X rays for three weeks. The total irradiation to the orbit amounted to 2,120 r. The patient died several months after operation.

Pathologic examination. The specimen is a vertical section through the content of the orbit including the eyelids, eyeball, orbital fat tissue, and muscles. On cross section the specimen measures 43 mm. by 37 mm.; and the eyeball 23 mm. by 17 mm. The section in our possession passed beyond the cornea.

The sclera is about five times normal thickness. It is covered with stratified epithelium which shows marked proliferation with papillarylike ingrowths. Beneath the epithelium there is a loose connective tissue with numerous distended vessels filled with blood. The tissue is markedly infiltrated with plasma cells and lymphocytes. The stroma of the sclera is vascularized and the vessels are surrounded by lymphocytes.

The choroid shows no pathologic condition.

The retina is separated and thrown in folds. Ganglion cells are absent. The walls of the retinal vessels are thickened.

The orbital tissues are invaded by tumor cells which are arranged into numerous roundish nodules separated from each other by strands of fibrous tissue. The metastatic tumor of the orbit repeats the pattern of the primary tumor of the lacrimal gland already described.

Numerous nodules of the tumor show either partial or complete necrosis. In some nodules the peripheral portion became necrotic, while in others the central part was destroyed. Almost all necrotic areas contain a few well-preserved tumor cells. It is of interest to note that complete necrosis is observed in the deeper situated nodules, while peripheral ones show either partial necrosis or almost none.

The structures of the lids are normal except for an edema of the tissue and congestion of the vessels.

Opinion. Metastatic cylindroma of the orbit with partial necrosis of the tumor after radiation (figs. 5 and 6).

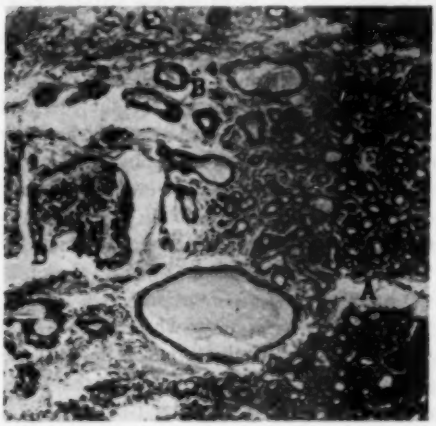

Fig. 4 (Irvine, Roberts, and Soudakoff). (A) Normal lacrimal acini. (B) Acini converted into tumor. (Case 2.)

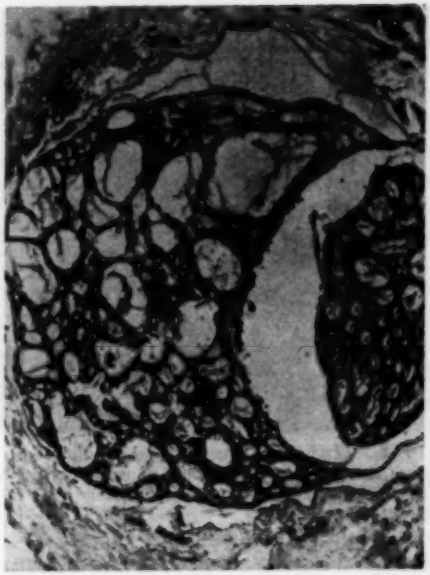

Fig. 5 (Irvine, Roberts, and Soudakoff). Typical cylindroma. (Case 2.)

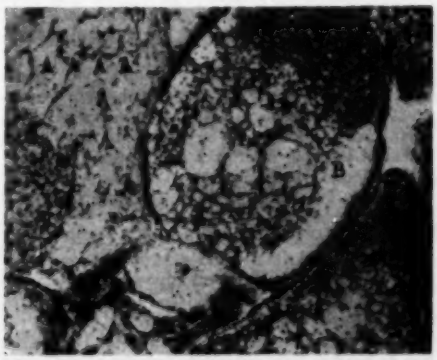

Fig. 6 (Irvine, Roberts, and Soudakoff). Effect of irradiation of the orbital tumor. (Case 2.) (A) Complete necrosis. (B) Partial necrosis of cylindromatous nodule.

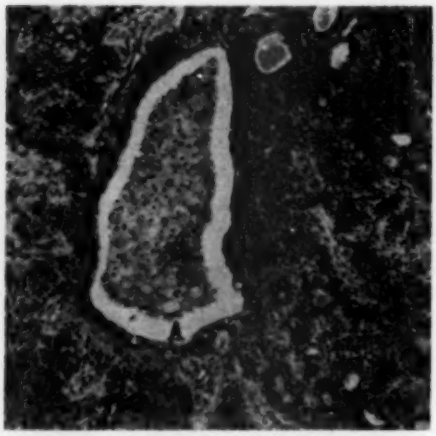

Fig. 7 (Irvine, Roberts, and Soudakoff). Tumor mass showing a newly formed lacuna (A) within which lies an island of tumor cells in stage of metaplasia. (Case 4.)

CASE 3

History. J. D., a man, aged 52 years, was first seen in Los Angeles County General Hospital on October 15, 1928. He gave a history of a gradual protrusion of right eyeball for about two years with rapid progression during six months prior to admission.

No lesion was found in the right eye. Vision was: 20/200. The left eye was lost through trauma in 1901. Radical right maxillary sinusotomy was performed and a tumor which filled the antrum and extended into the orbit was removed and reported to be a mixed tumor.

In 1933, a Krönlein operation was performed by Dr. Boyce because of recurrence of the orbital tumor. Histologic examination revealed mixed tumor of the lacrimal gland (Dr. Beigelman). The right orbital region was treated with X-ray irradiation. On April 3, 1933, pallor of the disc was recorded. Vision was: R.E., 20/70.

The patient was reëxamined in 1946. His vision was reduced to light projection because of extensive chorioretinitis and far-advanced hypertensive retinopathy. In 1950, there was a recurrence of the orbital tumor. A more comprehensive description and discussion of this case will be published elsewhere.

CASE 4

History. A 47-year-old white woman presented herself in the eye clinic of the Eye and Ear Hospital of Los Angeles April 29, 1948, with the complaint of swelling in the region of the left eye and poor vision of 35 years' duration. In 1928, the growing mass was treated with X rays. Further progress of the growth was temporarily stopped but 10 years later it began to grow again.

Clinical findings. There was a complete proptosis of the left eye which was pushed downward and inward by a tumor mass lying in the lacrimal gland region between the supraorbital rim and the globe. The left optic disc was somewhat pale.

Corrected vision was: R.E., 20/20; L.E., counts fingers at three feet.

The patient refused surgery until January 14, 1949, when an encapsulated mass was removed through the orbital approach. Two months later, vision was: L.E., counts fingers at 12 feet. There has been no local recurrence.

Histopathologic examination. The specimen is an oval-shaped tumor measuring 36 by 28 by 26 mm. It is firm in consistency and is well encapsulated. In cross section the tumor is of a meaty consistency and shows a number of soft amber-colored areas measuring from 0.5 mm. to pinpoint in size.

The tumor consists of masses of epithelial cells of uniform size and shape. There are many well-formed ducts and alveoli lined by one or two layers of epithelial cells. Many of them contain a pinkish staining amorphous material.

In some ducts there are islands of epithelial cells, the cytoplasm of which is increased two to three times in size, but most of the cells had lost their nuclei. In the central portion of the tumor the alveolar arrangements are less conspicuous and, although abortive glands appear, the cells tend to occur in dense masses. There are areas of necrosis.

The connective tissues between the islands of epithelium are composed of young spindle cells occurring in poorly developed collagen. The tumor is surrounded by a thick acellular connective tissue. A piece of normal lacrimal gland is attached to this capsule.

There are multiple foci of lymph-cell infiltration along the outer border of the capsule and a few lymph cells are found in the tumor tissue.

Opinion. Mixed tumor of the lacrimal gland (fig. 7).

COMMENTS

In 1901, Warthin[2] published a comprehensive review of tumors of the lacrimal gland. In 1904, Verhoeff[3] established the epithelial origin of mixed tumors of these glands. In 1922, Lane[4] reviewed the literature of 229 cases. In 1936, Benedict analyzed his 23 cases of primary adenocarcinoma of the orbit and summarized the present knowledge of these tumors.

According to Neely,[5] who reported one case, 267 cases of this type of tumor have been published before 1937. Since that date, according to our knowledge, 12 papers on this subject have been published.[6-17] If we add to this list, one case observed by Dvorak-Theobald,[18] five cases of Naffzie-

ger,[19] and nine cases of Reese,[20] the total number of cases reported to date, including our four cases, will amount to 329.

Proptosis is usually present and its degree has a direct relation to the size of the tumor. It is possible that inflammatory reaction of the surrounding tissues to neoplasm might be an additional factor in determining the degree of proptosis.

In most cases reported, the differences in exophthalmometric readings of both eyes were from five to nine mm., and the maximum recorded was 18 mm. (Flick[6] and Sanders' Case 4[13]). In Case 1, herein reported, exophthalmos measured 20 mm.

In Colley's case exophthalmos was apparently of the same degree because the affected eye appeared to be dislocated out of the orbit. The pupil was displaced 19 mm. downward and eight mm. inward; the stretched eyelids did not cover the whole cornea; keratitis e lagophthalmo developed. The eye movements were greatly restricted.

Gipner[22] removed a mixed tumor of the lacrimal gland from a patient whose "eye was proptosed so far forward that its posterior surface was anterior to the plane of the temporal orbit rim, and the lids could not be closed completely."

No exophthalmometric readings were reported in these two cases. According to the description, it is justifiable to surmise that in these two cases exophthalmos was between 16 and 18 mm.

After extirpation of the tumor, exophthalmos is usually greatly reduced but never disappears entirely. In our Case 1, exophthalmos was reduced from 20 to three mm. No exophthalmometric reading was made for Cases 3 and 4.

Vision is more or less reduced. There are three causes of diminished vision: (1) Change of refractive power caused by pressure of the tumor upon the eyeball; (2) edema of the disc caused by pressure upon the optic nerve (in a few cases optic atrophy developed, Case 4); (3) keratitis e lagophthalmo, Case 2.

As a rule, vision improves either slightly or considerably after the removal of the growth, but in a few instances there was no improvement. In our Cases 1, 3, and 4, vision improved after surgery. In Case 2, vision remained unimpaired until dissemination of the tumor appeared in the orbit and keratitis e lagophthalmo developed.

Movements of the affected eye are usually limited in the direction of the tumor, as in all our cases. If extrinsic muscles are involved into the process, the motility of the eye is restricted accordingly (Benedict's Cases 1 and 2[23]) or the eye might be completely fixed (Davies' Case 2[24]). Removal of the tumor, as a rule, restores the movement of the eye.

Anatomy. Cases 1 and 4 present more or less a similar anatomic picture. The tumors were composed of round or oval-shaped epithelial cells, remnants of normal glandular acini, and strands of mucoid stroma. The tumor cells showed a tendency to reproduce acini and ducts.

In Cases 1 and 4, as well as in a specimen brought by S. R. Irvine from Madras, were found islands of epithelial cells in various stages of metaplasia within many cystic spaces. Apparently, some of the ductlike formations in the mixed tumors of the lacrimal gland are formed by this process.

There were focal necroses in our Case 4. As this tumor was irradiated 20 years previous to extirpation, it is quite possible that these necrotic areas were caused by irradiation.

While Cases 1, 3, and 4 are of the mixed-tumor type, Case 2 may be classified as cylindroma. The stroma is composed of coarse trabeculas of connective tissue which may undergo hyaline or mucous degeneration (Ewing[25]). The tumor is either encapsulated or simply fuses with the gland. Capsules were present in all our cases.

According to the prevailing conception, mixed tumors of the salivary type are considered to be epithelial in origin arising either from acini or from misplaced or em-

bryonic portions of the gland. While some investigators are of the opinion that this kind of tumor is of dual origin (Neely, McFarland,[26] Reese[20] Sanders), others believe that mucoid materials derive from secretions of epithelial cells of the tumor (Ewing, Benedict, Godtfredzen, Hellwig[27]). According to Stewart,[28] "There is much evidence, however, that mucous cells, once formed, have considerable power of proliferation."

Willis[29] stresses that pleomorphism in mixed tumors is the result of activity of epithelial cells of the tumor.

Histologic findings in the four cases under discussion left open the question of whether the main or accessory lacrimal glands gave rise to the tumor. In Case 1 only a few normal acini were found. Neither in the original nor in the recurrent tumor of Case 3 were remnants of the normal gland found.

In Case 2 the tumor contained normal lobules of the lacrimal gland. Judging from the dimension of the tumor, we believe that it developed from an accessory gland. In Case 4, a small piece of the normal lacrimal gland was attached to the capsule of the neoplasm.

Benedict, after studying 23 cases, came to the conclusion that "it was impossible to determine in all cases, either at the operation or by histologic examination, whether the primary mixed or alveolar tumor was primarily in lacrimal glands or came from epiblastic or glandular structure elsewhere in the orbit."

Treatment and prognosis. Review of published cases of primary adenocarcinoma of the lacrimal gland reveals that extirpation of the growth is the only treatment. "Mixed tumors respond to irradiation, but require such high doses that surgical removal is a case of choice."[30]

Surgery gives good prognosis only in cases of adenocarcinoma of the mixed type. Some surgeons are of the opinion that surgical interference itself increases a chance of recurrence and, therefore, advise postponement of the operation until the tumor reaches considerable size.

Willis gives the following explanation to this clinical phenomenon, which is also observed in tumors of the salivary glands: "The smaller a tumor, the more likely it is that tumor genesis from salivary tissue is incomplete and still in progress or that satellite tumor foci not yet confluent with the main mass are present, and therefore the greater the likelihood that simple enucleation will leave behind the germs of further growth."

Stewart and Farrow define adenoid cystic epithelioma as true aggressive, metastatizing adenocarcinoma. The same applies to cylindroma. These two types of adenocarcinoma are resistant to irradiation.

Case 2 demonstrates this fact quite well. After the removal of the tumor the orbit was treated with large doses of irradiation —X-ray radiation to a total of 2,240 r and radium irradiation to a total of 253 mc.—but these doses did not prevent recurrences and dissemination in the orbit and in lymph nodes.

The eyeball received 3,280 mc. of radium emanated from radon seeds two weeks before the evisceration of the orbit. A histologic examination of the orbital content revealed that only some of the tumor-nests had become necrotic. The remaining nests either showed partial necrosis or none.

If these doses are compared with those recommended by O'Brien,[31] it will be seen that they are practically equivalent:

O'Brien (200 Kv. 5-20 ma. 2 mm. Cu filter 50 cm. TSD Total 4,500).

Case 2 (160 Kv. 5 cm.-oil 2.5 mm. Cu & 5 Al 50 cm. TSD Total 2,400; plus 250 mc./radon seeds).

According to Lane, mixed tumors of the lacrimal gland give recurrences in about 20 percent of the cases, with a death rate of 12.5 percent, but apparently both recurrences and metastases are more frequent than these figures indicate.

The majority of the cases which were followed up for many years developed either

recurrences or metastases. Out of 59 cases reported by Benedict, Godtfredzen, Maxwell,[33] Marzio, Sanders and Verhoeff, 12 (20 percent) had recurrences and 19 (32 percent) died from metastases.

In view of these facts, Forrest[32] recommends early exenteration of the orbit. But even this measure does not always prevent recurrences. For instance, Verhoeff's patient (Case 4) had recurrence one year after excision of the tumor and therefore exenteration of the orbit was performed. Twenty-eight years after the last operation the tumor recurred and invaded the bony walls.

The following case, which was under observation for 40 years, is also instructive in this regard. Dr. Ernest Fuchs operated a man, aged 23 years, who had a tumor of the lacrimal gland. Ten years later a recurrent tumor was removed.

When Adalbert Fuchs examined this patient several years later the affected eye showed complete ptosis and immobility. About 30 years after the first operation, a recurrent orbital tumor was removed. Histologic examination confirmed the previous diagnosis of mixed tumor of the lacrimal gland.

Several years after that operation, the tumor recurred involving the wall of the orbit and roof of the maxillary sinus. The affected tissues were removed and the eyeball was enucleated.

Pathologic examination of this tumor revealed basal-cell carcinoma. In spite of X-ray irradiation, recurrence of the tumor took place. After surgery the patient received large doses of irradiation. At the present time, he is 65 years old and his general health is good.[34, 35]

As has been pointed out, five cases which showed exophthalmos of from 18 mm. to 20 mm. have been reported. Both exophthalmos and vision improved after removal of the tumor (table 1).

In all five cases, in spite of exophthalmos of a high degree, visual acuity was either completely restored (three cases), or considerably improved after surgery. This sounds paradoxical and requires explanation.

Schaeffer, from measurements on 12 cadavers, found a total length of the optic nerve varying from 38 to 55 mm., the greatest variation being in the length of the intracranial part. Only in four cases was the length equal in the two fellow eyes. The difference was mostly between 25 and 35 mm.

According to Weiss, the posterior pole of the eyeball lies about 18 mm. in front of the orbital apex. The minimal distance recorded was 14 mm., and the maximal, 24 mm. (Whitnall[36]).

In the five cases under discussion, the eyeball was displaced forward between 18 and 20 mm., therefore, the distance between the posterior pole of the eyeball and the apex of the orbit ranged between 32 and 44 mm., depending upon the actual depth of the orbit.

Let us assume that the patients' orbits

TABLE 1

IMPROVEMENT SHOWN AFTER OPERATION IN CASES REPORTED IN LITERATURE

Surgeon	Duration (years)	Exophthalmos		Vision	
		Before Operation	After Operation	Before Operation	After Operation
Colley	2	18 mm.	not recorded	L.P.	6/6
Flick	8	18 mm.	4 mm.	20/50	20/15
Gipner	24	18 mm.	not recorded	6/30	6/6
Irvine	14	20 mm.	3 mm.	20/50	20/30
Sanders	2	18 mm.	not recorded	6/10	not recorded

were of the smallest dimension and the optic nerve had the maximal length. This combination would explain preservation of full vision because of the integrity of the optic nerve. But this hypothetical coincidence is unlikely. Can the orbital portion of the optic nerve be elongated at the expense of the intracranial portion?

The following anatomic data exclude this possibility:

1. The diameter of the optic nerve in the orbit is three or four mm., while within the skull the diameter is commonly 4.5 mm. in cross section. Since the intracranial opening of the optic canal is three to four mm. (Eisler [37]), it is evident that the anatomic condition excludes the possibility of the passage of the intracranial portion of the nerve into the optic canal.

2. In the optic canal, the nerve is surrounded by the dura, arachnoid, and pia membranes. Above, these are firmly united to each other, to the periosteum, and to the nerve. This excludes forward and backward displacements of the nerve (Wolff[38]). We must therefore admit that, in all five cases, the optic nerve was elongated by stretching.

Vision in all of these cases either came back to normal or was greatly improved after removal of the growth. This fact indicates that no severe damage to the nerve fibers occurred, and that the optic nerve apparently can sustain stretching to a certain degree without losing its function.

We must also keep in mind the fact that exophthalmos developed gradually—that is, stretching of the optic nerve proceeded slowly. The nerve is able to compensate and to remain viable if the stretching is slow. We do not know for how long this degree of exophthalmos existed. We realize quite well that the time is an important factor for preservation of normal function of the nerve in a case of exophthalmos of a high degree.

The extrinsic muscles in these cases were also elongated for about 16 to 18 mm. This elongation can be achieved without any damage to the muscles because striated muscles have a great amount of extensibility, and their function remains unimpaired due to preservation of their contractibility.

After removal of the tumor, exophthalmos did not exceed four mm. This means the external muscles of the eyes preserved their tonus and elasticity.

Summary

1. Four cases of primary adenocarcinoma of the lacrimal gland were presented. Three of them were classified as mixed tumors, and the fourth case as adenocarcinoma of the alveolar type.

2. Mixed tumors eventually recur and become malignant because of invasion of orbital tissue and destruction of orbital bones. Alveolar type of adenocarcinoma is more malignant because of a tendency to distal metastases.

3. Extirpation of the growth is the only treatment. Early removal of the tumor does not prevent recurrences.

4. The mixed tumor gives recurrences in about 20 percent of the cases, with a death rate of 32 percent.

5. In five cases of exophthalmos of 18 to 20 mm., vision was greatly improved or came back to normal after removal of the tumor.

6. The known anatomic data fail to explain this phenomenon. An hypothesis has been presented that the optic nerve can sustain a gradual stretching without damage to its fibers.

7. Restoration of the muscular movements can be easily explained by the extensibility and elasticity of the muscle fibers.

Grateful acknowledgement is made to Dr. Boyce and Dr. Ellis for their kind permission to use their cases for publication and to Dr. Adalbert Fuchs for his personal communication. We are indebted to the authorities of the Peking Union Medical College for submission of the necessary data concerning Case 2, as well as permission to report this case.

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A MIXED TUMOR OF THE LACRIMAL GLAND WITH EXTENSIVE METASTASES*

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Pathologic conditions involving the lacrimal gland are relatively rare. Of these, inflammatory processes, cysts, tumors, and the syndrome of Mikulicz are the most common. Tumors of the lacrimal gland are probably the most frequent lesions and are usually of the salivary or mixed type.

Fewer than 300 cases have been reported in the literature. Neely[1] reviewed 267 cases, and Sanders[2] reported 12 cases. The signs, symptoms, clinical course and treatment of mixed tumors of the lacrimal gland were discussed by Sanders and Flick.[3]

Salivary type tumors usually extend by direct invasion and tend to recur following incomplete removal. Metastases occurred in

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33 percent of the cases in the series reported by Sanders. This tumor must be regarded as potentially malignant.

Case report

The following proven case of mixed tumor of the lacrimal gland is interesting because of the long duration and the widespread metastases found at autopsy.

History. A 40-year-old, well-developed, well-nourished Negro entered Colon Hospital on August 31, 1942, for removal of a growth in the left orbit which had been noted for five months. The only complaint was protrusion of the left eye. The familial and past history were unremarkable.

Physical examination. He weighed 125 pounds. The blood pressure was 195/110 mm. Hg. Other physical findings were normal.

A history of a penile lesion was obtained, and serologic tests for syphilis were positive. Antiluetic therapy was initiated.

Eye examination. In the left orbit, a hard nodular mass in the region of the lacrimal gland displaced the eye anteriorly, medially, and inferiorly. The mass seemed to be fixed to the orbital rim. The movement of the left eye was limited. The intraocular pressure was normal.

Vision was: O.D., 20/30; O.S., 20/30; correctible to O.D., 20/20−1; O.S., 20/20 −1.

On September 1, 1942, a smooth encapsulated tumor in the region of the left lacrimal gland was excised through a Benedict's incision (external extraperiorbitotomy). No pedicle or evidence of invasion could be demonstrated. Postoperative recovery was uneventful.

The pathologic examination (S-36369) disclosed a well-encapsulated, gray-white mass with no pedicle or attachments measuring 2.2 by 1.5 by 1.5 cm. The cut surface was translucent, mucoid, homogeneous tissue.

Microscopically, the tumor was incompletely surrounded by a thin capsule of fibrous connective tissue which in some areas was infiltrated by round groups of epithelial cells from the tumor. The lesion was considered typical of a mixed tumor of the lacrimal gland, adenoid cystic epithelioma, and because of the infiltration of the capsule extending to the line of excision, local recurrence was predicted.

Course. On December 14, 1944 (two years and three months after the original excision), the patient was again admitted to Colon Hospital. The admission note stated that a mass which was thought to be a recurrence of the tumor had increased in size resulting in proptosis and pain in the left orbital region.

The tumor and a portion of the lacrimal gland were resected on December 15, 1944. The surgical specimen (S-44-1900) consisted of gray-white tissue measuring 2.5 cm. in its greatest dimension. Portions of the tumor were surrounded by a fibrous capsule which was infiltrated by tumor cells. A diagnosis of mixed tumor of the lacrimal gland was favored, although areas of the tumor suggested adenocarcinoma.

The patient was first admitted to Gorgas Hospital on September 17, 1945 (three years after the first excision), with a regrowth of the tumor causing proptosis and pain.

The physical examination revealed displacement of the left eye by a mass in the superior lateral portion of the orbit. The mass was hard, nodular, adherent to the bone, and about the size of a lemon.

Vision was: O.D., 20/50; O.S., 20/50. There was no diplopia.

Serologic tests for syphilis were strongly positive. A diagnosis of late latent syphilis, inadequately treated, was made and treatment was resumed.

Roentgenologic examination of the skull revealed neither bony erosion of the left orbital fossa nor evidence of metastases. There were no palpable lymph nodes.

Exenteration of the left orbit was performed October 2, 1945. A firm eye measuring 23 by 23.5 by 23.5 mm., attached to an

encapsulated gray-white mass (S-45-2306) measuring 36 by 26 mm., was removed. No involvement of the eye by the tumor could be demonstrated.

The histologic detail of the attached neoplasm was identical to that reported in previous specimens. The orbit was granulating from the base when the patient was discharged to the outpatient clinic.

In November, 1945 (two months after exenteration), several small, raised, nontender nodules were noted in the left temporal region, and readmission for roentgen therapy was advised. A total of 2,000 r was given in 10 daily doses, but the nodules did not regress. Cervical nodes were not palpable. He was discharged November 20, 1945, and seen at irregular intervals in Colon Hospital outpatient clinic.

On January 2, 1948 (three years after exenteration), readmission to Gorgas Hospital was required because of loss of weight over a period of six months and an increase in the size of nodular tumor which extended over the frontal and temporal regions. A "sticking" sensation was sometimes present in the mass, but no pain was experienced. No enlarged occipital or cervical nodes could be palpated, but one firm, movable, nontender node was felt close to the left sternoclavicular joint, and a few discrete axillary and inguinal nodes were present.

Roentgenograms of the skull revealed a destructive bone defect, measuring 4.0 by 3.0 cm., which involved the lateral orbital wall posterior to the frontal sinus. Roentgenograms of the chest disclosed multiple small discrete lesions in the parenchyma of both lung fields predominantly in the bases.

Two pink-white lymph nodes (S-48-12) were resected from the left supraclavicular region. The larger node measured 2.0 by 1.5 by 1.5 cm. These nodes were almost entirely replaced by a highly anaplastic, metastatic, epithelial neoplasm consisting of poorly differentiated cells which formed no constant pattern (fig. 1).

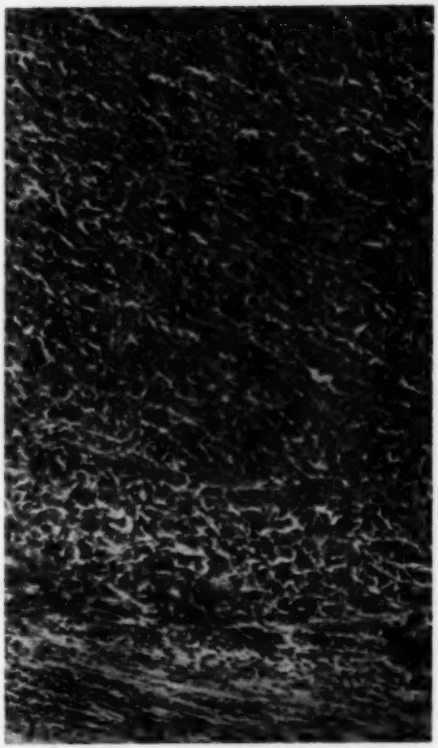

Fig. 1 (McKinney and Butz). Lymph node, showing anaplastic tumor infiltration.

There was no tendency toward gland formation, and the cells were arranged in a pavementlike juxtaposition. Elsewhere areas were noted which were suggestive of a cylindromatous architecture. No similarity to the pattern of the original growth was observed.

In view of the metastases to the supraclavicular nodes and to the lungs, no attempt was made to excise the original tumor. Although roentgen therapy was considered to be of little value, another course was administered, and the patient was discharged on February 17, 1948.

In May and August, 1948, deep roentgen therapy over the orbital region which did not exceed a total of 2,100 r in air on each admission was instituted for the relief of pain. A roentgenogram of the chest in August, 1948, disclosed numerous large dense

Fig. 2 (McKinney and Butz). The gross appearance of the tumor in the late stages. The nodularity and ulceration are well seen.

lesions in the pulmonary parenchyma and erosion of the seventh rib in the posterior axillary line.

In January, 1949, a tender, gradually enlarging nodule appeared on the right anterior chest wall at the sternal border. On admission he complained of a nonproductive cough with mild exertional dyspnea, but no orthopnea or edema.

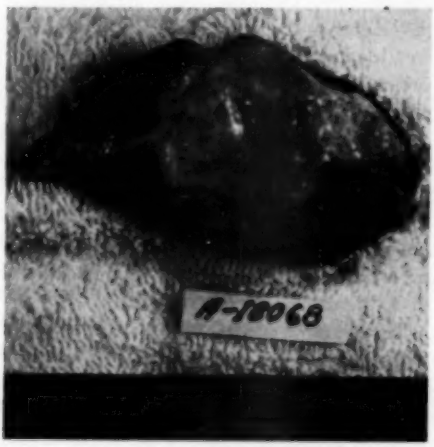

Fig. 3 (McKinny and Butz). Microscopic appearance of the suprasternal metastasis.

An ulceration developed in the orbital tumor, and occasional bleeding occurred (fig. 2). Pain was controlled by demerol, 50 mg. every four hours. After March, 1949, weight loss was approximately one pound per week. The condition of the patient progressively deteriorated, and marked dyspnea, orthopnea, and a productive cough were combined with severe edema of the extremities. He was placed on the critically ill list on July 8, 1949, and died on August 23, 1949.

Autopsy (A-18068). The body was that of a poorly nourished Negro, weighing 83

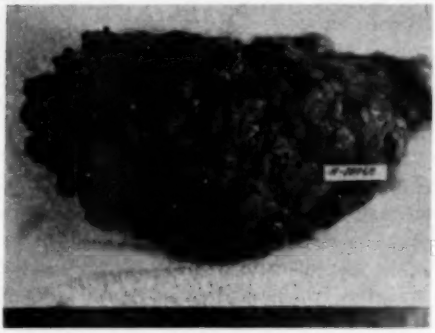

Fig. 4 (McKinney and Butz). The pleural surfaces of the lungs are studded with neoplastic nodules.

pounds and measuring 63 inches in length.

Above the left orbit and extending along the lateral margin of the supraorbital ridge was a mass 6.0 by 8.5 cm. The left eye was absent, and the orbit was filled with tumor tissue. Several ulcerations in the skin covered with crusts and serous exudate were present over this mass.

The posterior wall of the orbit was eroded with direct extension of the tumor into the inferior surface of the frontal lobe of the left cerebral hemisphere. The destruction of the bone and growth of the mass into the left antrum of Highmore and the ethmoid sinus were demonstrated.

Another mass (fig. 3) which measured 8.4 by 9.0 cm. was palpable beneath the skin covering the body of the sternum. The pleural surfaces (fig. 4) were studded with gray-white nodules which varied from 3.0

to 4.5 cm. in diameter. Thick fibrous adhesions between the pleural surfaces were liberated with difficulty.

The right lung weighed 800 gm. and the left lung weighed 590 gm. Within the pulmonary parenchyma (fig. 5) firm white nodules were present which measured up to 6.0 cm. in diameter.

The supraclavicular and mediastinal lymph nodes were replaced by tumor tissue. Near the cardiac end of the stomach on the lesser curvature, a large gray-white perigastric lymph node was noted.

The sections were fixed in 10-percent formalin-alcohol solution and stained with eosin and hematoxylin. The tumor in the supraorbital region (fig. 6) was composed of extensive masses of epithelial cells, chiefly arranged in circular groups resembling gland acini, but also present in the form of small rosettes, bands, papillas, and sheets.

The cells varied in size and shape from cuboidal to columnar. On the inner margin of the adenoid cystic formations, the cells showed a tendency to be flattened, while those more distant from the lumina were cuboidal and columnar in form.

The cytoplasm exhibited an acidophilic stain, but the cell boundaries were poorly defined. The nuclei varied in staining reaction; many were uniformly dark while others were vesicular. Infrequent mitoses were encountered.

The cystic spaces were filled with homogeneous, amorphous pink-staining material. This material was similar to that in the intercellular matrix which, combined with an abundant mucoid acidophilic stroma, formed the architectural background.

Masson's trichrome stain for connective tissue was positive throughout the stroma. Diffuse and focal aggregations of lymphocytes and occasional spindle cells were noted in this region. Elsewhere, solitary swollen epithelial cells were present within the stroma, bathed in mucinous material, giving the appearance of juvenile cartilage.

Although the histology was generally consistent with that of mixed tumors of salivary glands, in areas the lesion resembled certain epitheliomas arising in appendage structures of the skin, especially the Brooke tumor. However, the structure of this salivary gland tumor has a coarse pattern, and its prognostic implications are known to be serious (Stewart[4]).

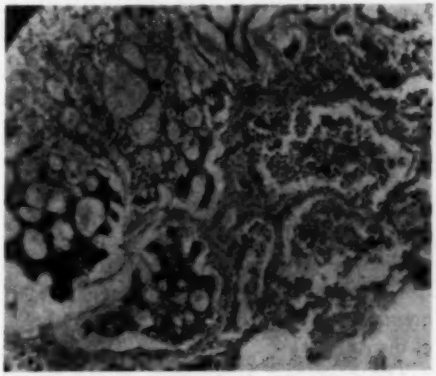

Fig. 5 (McKinney and Butz). Typical histologic appearance of tumor within the lung parenchyma.

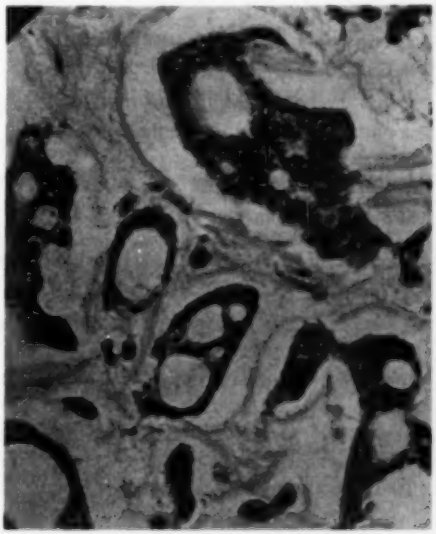

Fig. 6 (McKinney and Butz). High-power appearance of the original tumor, showing the coarse cystic epithelial formations and the myxomatous stroma.

The metastases to the lymph nodes (fig. 1) in this case had a unique character. No definite architectural pattern was produced, but a diffuse infiltration of highly anaplastic epithelial cells replaced the nodes leaving only an outer rim of lymphocytes.

Mitoses were not infrequently encountered. These cells were cylindromatous, tapering at their distal portions, and tending to lie free or in pavementlike proximity to one another. There was no evidence of myxomatous reaction between the epithelial elements.

The histologic appearance of the metastases in the lymph nodes, therefore, differs sharply from those found in the brain and lungs where the pattern reverted to that of the original tumor.

Summary

A case of salivary type of mixed tumor of the lacrimal gland, with repeated excision and recurrence over a period of seven years, is presented. Extensive widespread metastases to the pleura, lungs, and lymph nodes eventually occurred.

It is believed that the natural history of this type of tumor was fulfilled in this case. There was a strong tendency to recur with eventual metastases. The time necessary for this sequence of events to occur is protracted in comparison with other malignant tumors. However, once metastases begin, the growth appears to take on new impetus. This is particularly apparent in the metastases within the lymph nodes of the supraclavicular region, mediastinum, and perigastric region of this case. In these foci, the tumor is highly anaplastic.

This tumor and adenoid cystic epithelioma, salivary-gland type, are considered identical. The coarse cystic pattern is contrasted with the more delicate architecture of the ordinary Brooke tumor of the skin.

This characteristic of a metastatic potentiality not common to the Brooke tumor, when found in the lacrimal gland or a major or minor salivary gland, implies a grave prognosis and the necessity for early and adequate treatment. Furthermore, superficial resemblance to the Brooke tumor of the skin is paradoxical, for while the skin lesion almost never metastasizes, the adenoid cystic epithelioma of the salivary gland type is notorious in this respect.

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Gorgas Hospital.

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CHANGES IN THE CORNEAL CURVATURE FOLLOWING CATARACT EXTRACTION*

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This report concerns the changes in corneal curvature as determined with the keratometer at various intervals after cataract extractions in which corneoscleral sutures were used. Numerous similar studies have been recorded in the literature, but few with serial findings in cases with true corneoscleral sutures.

In 1932, Busacca reported keratometric studies on 117 eyes before, "shortly" after, and several times later following cataract extraction. No sutures were used, and some of the cases were performed with and others without a conjunctival flap. He found that the decrease in curvature of the horizontal meridian paralleled the increase in curvature of the vertical meridian.

In 1933, Kawahara reported on a series of 111 eyes after corneal flap, conjunctival bridge flap, and an ordinary conjunctival flap. With these techniques, the resultant final astigmatism was against the rule; whereas, following linear extractions, the final astigmatism was found to be with the rule.

In 1935, Groenholm made keratometric measurements on 200 eyes. In those without sutures the average astigmatism, 10 days postoperatively, was 8.9 diopters, compared to 7.6 diopters in those with one preplaced Liegard corneoscleral suture, and 4.8 diopters in those with two corneoscleral sutures. He found that within the next two months the average astigmatism was reduced by one half over what it was at 10 days.

In 1936, a further report showed that the increase in refractive power of the horizontal meridian was greater than the decrease in the vertical meridian. At 10 days the average decrease in the curvature in the vertical meridian in those without sutures was 4.1 diopters, with one suture 3.5 diopters, and with two sutures 2 diopters. The increase in the horizontal meridian was 4.8, 4.1, and 2.8 diopters respectively in the three types.

The previous studies of this problem have not included keratometric measurements at regular frequent intervals after operation, in order to demonstrate the type, degree, and duration of changes in astigmatism postoperatively. Also of interest is the effect of corneoscleral sutures on the corneal curvature both immediately after operation and after the wound has healed completely. Lastly, this study will consider the final spherical equivalent after cataract extraction.

MATERIAL AND METHODS

The study which I am reporting here is based upon the keratometric data of patients on whom extraction of senile cataracts were performed at the Illinois Eye and Ear Infirmary by members of the attending and resident staff.

The techniques employed in those cases were as follows: Graefe section with two Verhoeff corneoscleral sutures—10 cases; Graefe section with two Verhoeff corneoscleral sutures in one patient who had had a previous iridectomy and cyclodialysis (not included in total statistics); Graefe section with two McLean corneoscleral sutures—one case; Graefe section with one Stallard corneoscleral suture—one case; Graefe section with two Kirby corneoscleral sutures—one case; keratome and scissors section with two McLean corneoscleral sutures—32 cases; scratch incision with two Verhoeff sutures—one case.

Measurements were made with the Bausch

* From the Illinois Eye and Ear Infirmary of the University of Illinois, College of Medicine. Presented before the Chicago Ophthalmological Society, April, 1950.

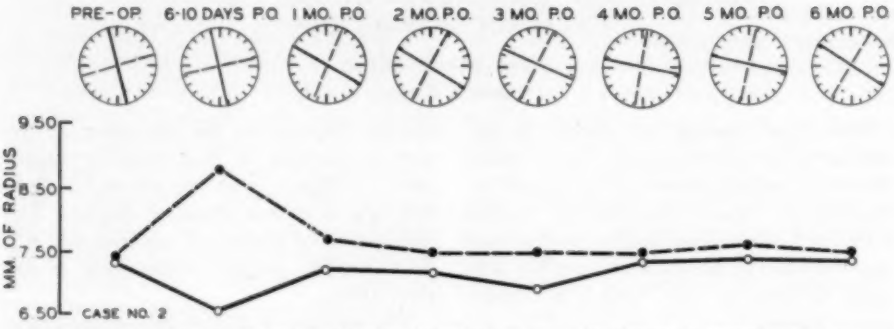

Fig. 1 (Floyd). Representative case showing the typical postoperative changes in corneal curvature. See text for explanation of graph.

and Lomb, one-position keratometer on a total of 47 eyes at the following times: preoperatively, six to 10 days postoperatively, and at monthly intervals thereafter for six months.

Results in uncomplicated cases

To demonstrate visually the changes which occur in the corneal curvature, individual graphs were prepared for each eye. Twenty-eight of these, or approximately 60 percent, were found to follow a similar pattern.

A curve, typical of this large group, is seen in Case 2 (fig. 1). In the graph, the upper row of circles represents the principal axes of the astigmatism at the time of the particular reading. The lower portion of the graph represents the corneal curvature in mm. of radius. Broken lines indicate position and radius of curvature of the less acutely curved (flatter, weaker) corneal meridian. Solid lines indicate the position and radius of curvature of the more acutely curved (stronger) corneal meridian.

The classical postoperative astigmatism, as described in the days before corneoscleral sutures, consists of an increase in radius of curvature of the more nearly vertical and a decrease in radius of curvature of the more nearly horizontal meridian. This condition was present at the one-month reading in the majority of my cases. The amount of this classical postoperative astigmatism was quite small in nearly every instance.

My observations at the time of the 10-day reading differ from the classical ones in that a fair proportion of my cases at that time showed a marked astigmatism, with the axis of increased radius of curvature in the more nearly horizontal meridian and a decreased radius of curvature in the vertical. In nearly all cases, this astigmatism disappeared or gave way to a slight degree of classical astigmatism one month later.

Postoperative astigmatism with the shorter radius of curvature vertically has not been reported in any cataract series without corneoscleral sutures and, since its disappearance in my series coincided with the time of the removal of the sutures, I am forced to conclude that it is essentially a suture phenomenon, or a change due to well-anchored and snugly tied corneoscleral sutures. There is no indication in this series that this suture astigmatism is in any way disadvantageous.

Three separate types of variations of the suture astigmatism were found to exist, which I feel are probably representative of minor deviations from the larger group of eyes just described. The first of these consists of five eyes in which the radius of curvature is increased in both the horizontal and vertical axes at the first postoperative measurement. I am unable to postulate a satisfactory explanation for this phenomenon.

Case 21 (fig. 2) represents one such eye.

It is seen that, after the first postoperative reading, the type of curve is essentially that of the large group already described.

Another type of variant was found to exist in two eyes one of which is shown in Case 46 (fig. 3) in which both radii of curvature are decreased at the time of the first postoperative reading. It thereafter as-

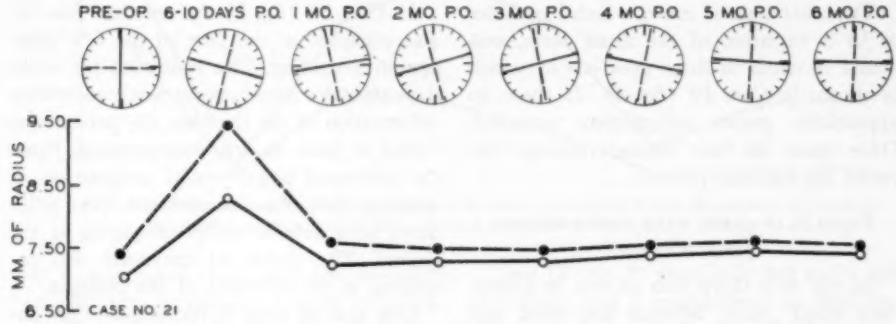

Fig. 2 (Floyd). One of five eyes in which both the horizontal and vertical radii of curvature were increased at the first postoperative measurement.

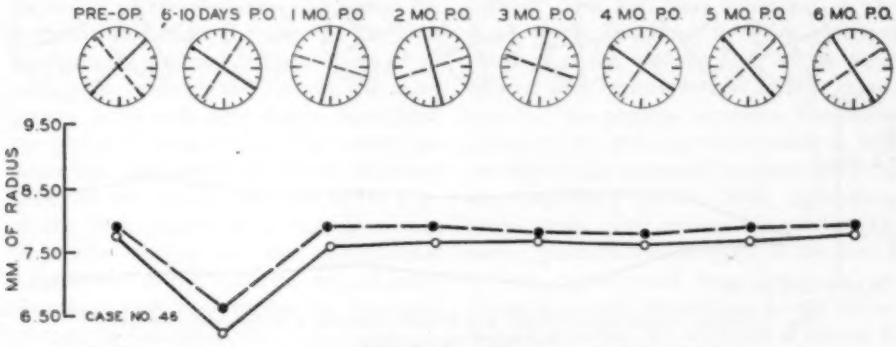

Fig. 3 (Floyd). One of two eyes in which both the horizontal and vertical radii of curvature were decreased at the first postoperative reading.

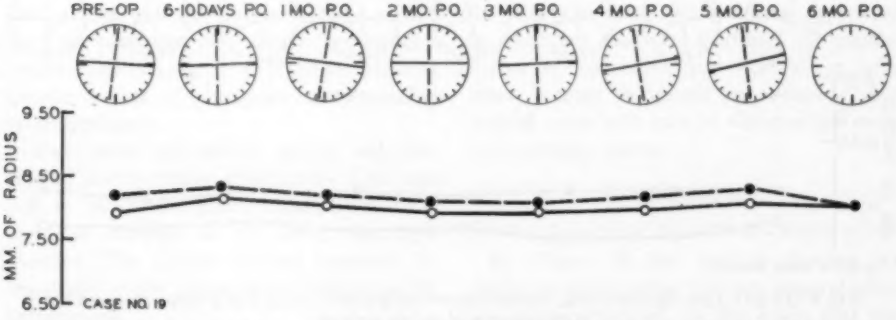

Fig. 4 (Floyd). Representative case of three in which no appreciable "suture astigmatism" occurred.

sumes the typical postoperative course. In reviewing these two cases no unusual occurrences at the time of surgery or thereafter could be found to account for these irregularities.

The other type of curve, which I consider to be a variation of the usual form, was found to occur in three eyes one of which is shown in Case 19 (fig. 4). In these no appreciable suture astigmatism occurred. Once again the later corneal readings followed the familiar pattern.

Results in cases with postoperative complications

In one case there was an iris incarceration which later, between the third and fourth postoperative readings, developed a filtering bleb. The astigmatism failed to diminish steadily as noted in the previous cases. As might be expected, there was an actual increase in corneal astigmatism at the time the filtering bleb occurred.

In Case 36 (fig. 5) the anterior chamber was collapsed at the time of the first postoperative reading. This continued for seven days after this measurement was made. After reformation of the chamber, the patient was found to have an iris incarceration. From the continued large corneal astigmatism, it appears that the incarcerated iris pillar acted as a definite wedge in gaping of the wound. The radius of curvature was increased in the meridian of the prolapse.

One case of delayed formation of the anterior chamber occurred for only the first

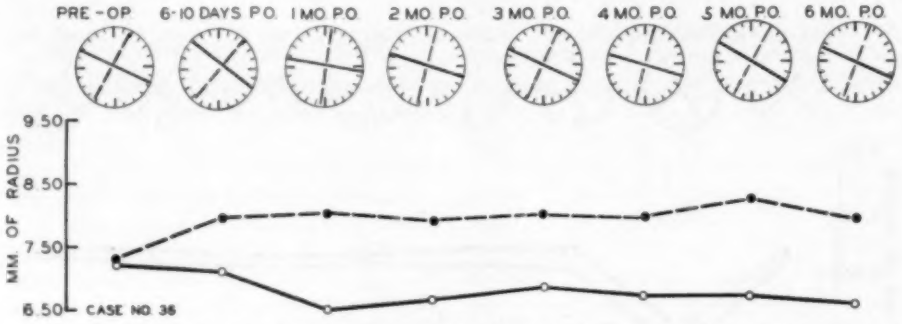

Fig. 5 (Floyd). A case in which there was delayed reformation of the anterior chamber and an iris incarceration.

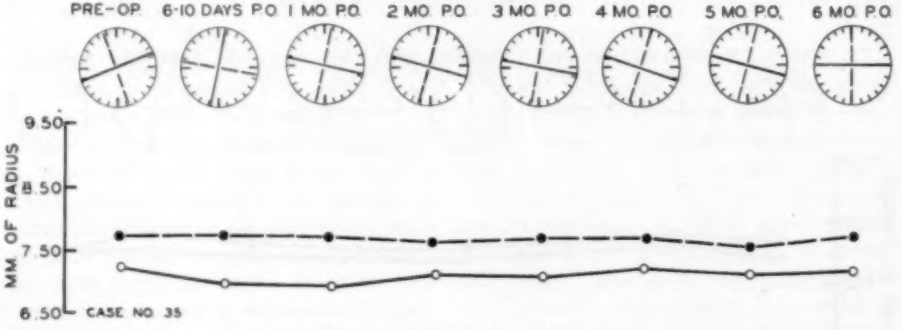

Fig. 6 (Floyd). Case demonstrating the usual suture astigmatism at the first postoperative reading in the presence of an iris prolapse.

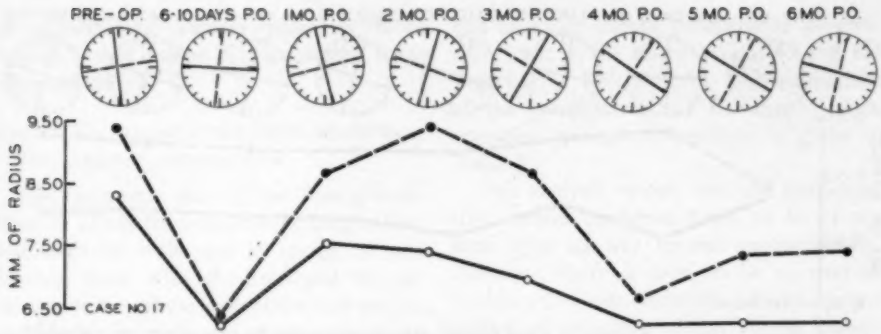

Fig. 7 (Floyd). This case had had two antiglaucoma surgical procedures before the cataract extraction. In addition a large loss of fluid vitreous occurred at the time of surgery.

two postoperative days, and the so-called "normal" type of astigmatic curve followed.

In Case 35 (fig. 6) an iris prolapse occurred at the 12-o'clock position on the fifth postoperative day. Despite this fact, the radius of curvature was still less in the vertical meridian at the time of the first postoperative reading. At the second and all subsequent readings the vertical curvature became flatter with little change throughout the period of observation. This would indicate that the customarily found decreased radius in the vertical meridian at the time of the first postoperative reading results from the tension of the corneoscleral sutures and, in this instance, was of sufficient magnitude to overcome the doorjamb effect of the prolapsed iris.

By the time of the second postoperative reading the sutures had been removed and ceased to exert sufficient effect on the corneal shape, and the cornea became arched over the prolapsed iris, thereby producing a pronounced toric curve with the meridian of greater radius of curvature corresponding to the prolapse.

Two cases had rather severe and protracted postoperative iridocyclitis. One was felt to be of the phaco-anaphylactic type, and the etiology in the other remained obscure. The graphs showed complete irregularity in the postoperative course of the astigmatism.

Case 17 (fig. 7) previously had had a full iridectomy and a cyclodialysis as antiglaucoma procedures. At the time of cataract extraction, a large amount of fluid vitreous was lost, and a loop extraction was performed. The last three recordings in the more nearly horizontal meridian represent readings at the extreme limit of the keratometer with extremely small radii of curvature and are perhaps somewhat inaccurate. However, the more acute curvature in both meridians may represent the early shrinking of a beginning phthisis bulbi. Ophthalmoscopic study after removal of the lens revealed glaucomatous atrophy of the disc.

Two eyes showed large, relatively unchanging corneal astigmatism during the entire six months, one of which is shown in Case 10 (fig. 8). Both of these cases had loss of vitreous at the time of surgery. It is possible that vitreous was incarcerated in the wound in these two instances, supported by the fact that the meridian of greater radius of curvature was vertical in both cases. It must be pointed out, however, that several cases with loss of vitreous had normal recovery curves.

Discussion

Over-all rate of change of astigmatism

In Figure 9, the average amount of change in astigmatism for each interval after operation is charted. In the event that the

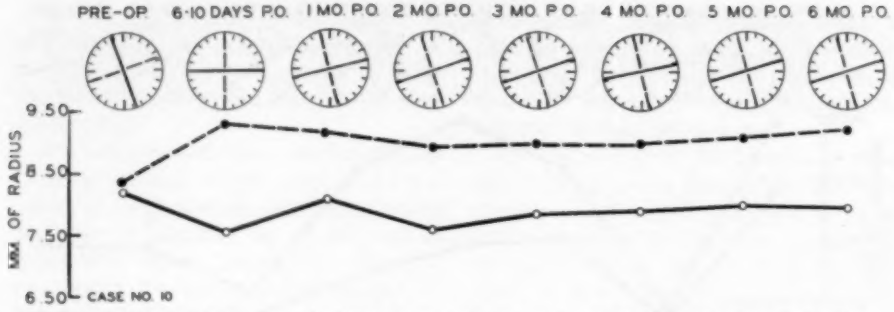

Fig. 8 (Floyd). One of two cases in which formed vitreous was lost at the time of surgery and which continued to show large corneal astigmatism during the period of observation.

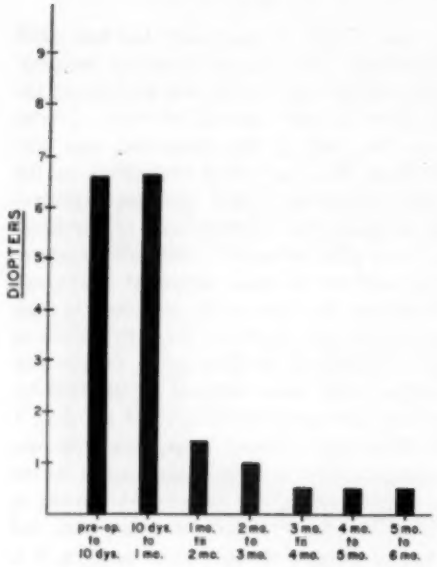

Fig. 9 (Floyd). Variation (in diopters) of corneal astigmatism in the first six months postoperatively.

astigmatic error changed from "with" to "against" the rule, or vice versa, the arithmetic total of the two was used as the amount of change.

As would be anticipated, the greatest changes occurred between the preoperative and 10th day postoperative measurements (6.54 diopters), and the 10th day to one month interval (6.61 diopters).

There is a sharp reduction in the amount of change occurring during the second month, falling to 1.4 diopters. Between the second and third month the change averaged 1.08 diopters. After three months, the astigmatism changes approximately one-half diopter each month. Inasmuch as definite corneal changes were still occurring at this time, further follow-up measurements might be expected to reveal change.

Of practical significance, it would appear that prescription of lenses less than three months postoperatively might well be of "temporary" nature and would have to be changed later. This is contrary to the generally accepted belief that glasses prescribed two months postoperatively are usually "permanent."

Mention was made of Kawahara's findings that, in those cases in which a conjunctival flap was used, the resultant final astigmatism was against the rule as compared to with the rule astigmatism in linear extractions. In our series, the final astigmatism was with the rule in 19 cases, against the rule in 26 cases, and the cornea was completely spherical in one case.

Astigmatism against the rule is probably due to incomplete reapposition of the corneal flap, resulting in a relative vertical flattening of the corneal curvature. The fairly even distribution of with and against the rule astigmatism in our cases would further substantiate the belief that the use

of corneoscleral sutures promotes more normal wound healing with a resulting more spherical cornea.

Effect of preoperative upon postoperative corneal astigmatism

The cases were divided into four groups, those in which the preoperative astigmatism was with the rule and in excess of one diopter, those with the rule and of one diopter or less, those against the rule and of one diopter or less, and those against the rule and greater than one diopter. One case had an exact oblique preoperative astigmatism (that is, the major axis at 45 and 135 degrees) of 1.50 diopters. The comparison of the preoperative and six months' postoperative corneal astigmatism is given in Table 1.

TABLE 1

Comparison of preoperative and six months' postoperative corneal astigmatism

Preoperative astigmatism with the rule and greater than one diopter	
No. of cases—14	
Six months' postoperative findings:	
With the rule and greater than one diopter	7
With the rule and one diopter or less	4
Against the rule and one diopter or less	1
Against the rule and greater than one diopter	2
Preoperative astigmatism with the rule and one diopter or less	
Number of cases—16	
Six months' postoperative findings:	
With the rule and greater than one diopter	4
With the rule and one diopter or less	3
Against the rule and one diopter or less	3
Against the rule and greater than one diopter	6
Preoperative astigmatism against the rule and one diopter or less	
Number of cases—12	
Six months' postoperative findings:	
With the rule and greater than one diopter	1
With the rule and one diopter or less	1
Against the rule and one diopter or less	1
Against the rule and greater than one dipoter	9
Preoperative astigmatism against the rule and greater than one diopter	
Number of cases—3	
Six months' postoperative findings:	
With the rule and greater than one diopter	0
With the rule and one diopter or less	0
Against the rule and one diopter or less	0
Against the rule and greater than one diopter	2

(One of the cases in this group had a spherical cornea at the time of the six months' reading.)

The case with oblique preoperative astigmatism was found to have corneal astigmia against the rule of 1.5 diopters at the six months' reading.

This analysis reveals that the postoperative corneal curvature tends to be of the same type as was present preoperatively. However, there is seen to be an over-all tendency to a relative increase in the vertical radius of curvature. This is most clearly demonstrated in that group of cases in which the preoperative astigmatism was with the rule and of one diopter or less.

Postoperative flattening of corneal curvature

These data allow analysis of the total corneal change occurring from the preoperative to postoperative conditions. The spherical equivalent of the corneal curvature was used, as expressed in mm. of radius, and a comparison was made between the preoperative and postoperative reading at six months. Depending upon the magnitude of the radius of curvature, any specified difference in radii will produce varying dioptric changes. For this reason the more familiar dioptric measure cannot be accurately used, but instead changes are recorded in changes in fractions of millimeters of radius. In gen-

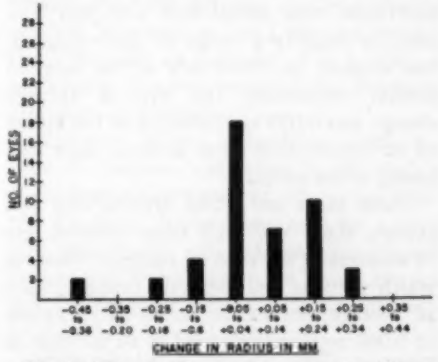

Fig. 10 (Floyd). Change (in mm.) of radius of curvature of the cornea from preoperative readings to those taken six months postoperatively.

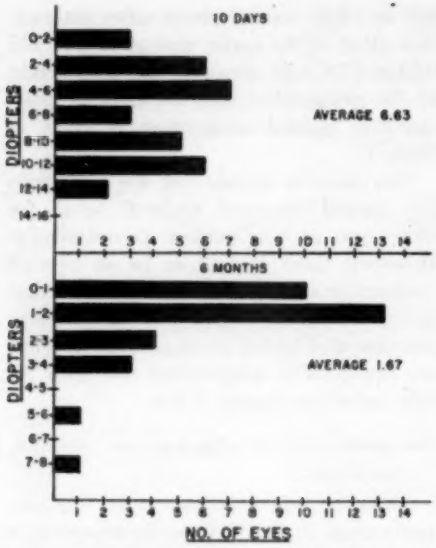

Fig. 11 (Floyd). Amount of astigmatism in diopters with keratome-scissors section.

eral, 0.1 mm. difference in radius equals approximately 0.5 diopter.

It is seen in Figure 10, that 18, or well over one third of the cases, remained within 0.1 mm. of the same average radius of curvature as existed before surgery. Only eight cases exhibited a decrease exceeding 0.05 mm., in comparison with 20 eyes which showed an increase of 0.05 mm. or more. The greatest deviations in the spherical equivalent were minus 0.41 and plus 0.31 mm., or roughly a range of approximately two diopters to either side of the original corneal refraction. The over-all average change was 0.039 mm. increase in the radius of curvature, or in other words a slight flattening of the cornea.

These cases were then divided into two groups, those with and those without loss of vitreous at the time of surgery. Those in which vitreous was lost were found to have an average increase in radius of curvature of 0.068 mm., as compared to an increase of 0.032 mm. when vitreous was not lost. This would indicate some tendency to flattening of the cornea postoperatively in all cases, but to a greater extent in those with previous loss of vitreous.

Type of section and sutures

A comparison of the group of 32 cases with the technique of keratome-scissors and two McLean sutures versus the group of cases with Graefe section and Verhoeff sutures (10 cases) showed no difference in the immediate postoperative astigmatism. After six months, the average astigmatism as measured by keratometry was 1.67 diopters for the keratome-McLean group and 2.46 diopters for the Graefe-Verhoeff group. However, these differences are not statistically significant because of the small number of cases and relatively large differences in the individual readings.

In the group of cases where keratome-scissors sections were used it is seen (Fig. 11) that at 10 days the amount of astigmatism is extremely variable and fairly evenly distributed from 0.0 to 12 diopters, with an average astigmatism of 6.63 diopters. This variability might be due to variations in how tightly the sutures were tied.

At the final reading, the degree and variation of astigmatism is seen to be very small in nearly all cases, all but five being of less than three diopters, and with an average of 1.67 diopters.

Conclusions

1. Following extraction of senile cataract using corneoscleral sutures in 47 cases, keratometric measurements have shown rapid changes in astigmatism during the first postoperative month and a slower, but still significant, change during the following three months.

2. A fairly uniform type of postoperative recovery curve was seen to be present in approximately 80 percent of the cases studied. Those which showed marked variations from this norm could, in most cases, be explained by operative or postoperative complications associated with poor healing of the corneal incision.

3. A marked decrease of the radius of curvature in the vertical meridian (astigmatism with the rule) was present six to 10 days postoperatively, and this is attributed to the traction of the corneoscleral sutures. This astigmatism disappears after the removal of the suture, and may be a factor in the reduction of final astigmatism against the rule.

4. Postoperative corneal curvature tends to be of the same type as was present preoperatively when two corneoscleral sutures of the preplaced type are used.

5. A slight tendency to increased final flattening of the cornea in its spherical equivalent occurs, especially in cases in which vitreous was lost at operation.

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LINT IN THE ANTERIOR CHAMBER FOLLOWING INTRAOCULAR SURGERY*

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The presence of foreign material of almost endless variety implanted into the anterior chamber by perforating injuries is frequently observed, especially in war. It is well known, too, that any operation upon the anterior segment of the eye carries with it danger of introducing bacteria or foreign material such as cilia, pieces of rubber from irrigators, talc from rubber gloves, bits of ophthalmic ointment, and fibers from cotton sponges that are used for wiping off blood and fluid.

The foreign material either enters the eye on instruments that are introduced into the anterior chamber, or gets into the anterior chamber when the corneal flap is lifted during the operation, or by negative pressure when the lens is removed, or syringed in with the fluid used for irrigation of cortical and blood remnants. Judging from personal experience and from the ophthalmic literature, these accidents are fortunately rare. Every careful ophthalmic surgeon is, or should be, fully aware of the hazard. The problem of prevention is not an easy one.

In 1949, Sitchevska and Payne reviewed the voluminous literature on cilia in the anterior chamber and reported two additional cases following traumatic perforating wounds of the cornea. Although the authors state that "occasionally the cilia may be implanted into the anterior chamber during surgical intervention for a cataract extraction" they cite no instances of it, nor has a moderately complete search of the literature revealed any such case.

Moreover, Mukai in studying 5,000 records of cataract extraction in Elschnig's clinic found no instance of cilia in the anterior chamber. It therefore must be a very rare occurrence, although an ever-present danger, particularly when the lashes are cut and the conjunctival sac is not completely irrigated before opening the eye.

Sitchevska and Payne's study supports the conclusion that cilia may be retained in the anterior chamber for a number of years

* From the Department of Ophthalmology, Northwestern University Medical School. Presented at the 86th annual meeting of the American Ophthalmological Society, Hot Springs, Virginia, June, 1950.

without giving rise to symptoms. Da Silva in a recent report, for example, cites the case of an eyelash which lay in the anterior chamber for about 33 years without producing inflammatory reactions. It seems best, however, to attempt the removal as soon as possible because of various threatening complications such as iritis, infection, and later the formation of pearl or epithelial cysts.

In 1945, Chamlin described the effect of talc in the anterior chamber after ocular surgery and demonstrated granulomatous lesions on the irises as the result of introducing talc, such as is used on rubber gloves in the operating room, into the eyes of rabbits.

His experimental work supported that of German who found that talc (hydrated magnesium silicate) once immobilized in granulomas remains permanently in the tissues and is a protective mechanism that may, however, interfere with normal healing processes. He revealed that under polarized light the silicate crystals stand out in brilliant illumination "as an electric sign at night." German also found that cellulose and cotton fibers behave in similar manner.

Chamlin recommended that all talc be removed from the gloved hands by playing a stream of sterile saline solution over them, rather than by immersing them in quiet solution.

There are several reports in the literature of the presence of droplets of ophthalmic ointment in the anterior chamber. Tietze noticed a pink globule of about 1.5-mm. diameter floating in the anterior chamber following the use of one-percent prontosil ointment in a case of perforation of the cornea by a foreign body. It produced a mild iritis at the time, and, one month later, a recurrence which quickly subsided. The particle disappeared eight months after the injury.

Binder reported a case of a patient whose right cornea sustained a perforating wound, and an ointment believed to be composed of a sulfonamide preparation was instilled. He noticed two yellowish globules floating in the aqueous. These later coalesced into one that was apparently lighter than aqueous for it sought the highest point in the anterior chamber. (Tietze observed this phenomenon in his case also.) Binder waited six months, during which time the eye was quiet, and then removed the material through a limbal keratome incision. He believed that the ointment had been aspirated into the anterior chamber.

On the other hand, J. W. Smith reported "that it was not necessary to open the anterior chamber to remove the globule because the antiseptic salve always absorbed." He was supported in this conclusion by Sykowski, who cited two instances of ointment globules in the anterior chamber after intracapsular cataract extraction that absorbed in 21 and 16 days respectively.

Smith mentioned a case where a piece of glass, broken from the end of an anterior chamber irrigator, remained in the anterior chamber. It produced a low-grade inflammation and was accordingly removed. He said that irrigators with glass tips should be condemned. However, their use is defended by Doherty who pointed out that the bulbous part of his glass irrigator serves two purposes: (1) It prevents forcible irrigation of the anterior chamber, and (2) it serves to prevent the introduction of minute particles of rubber coming from the inside of the rubber bulb. Should such particles be present they can readily be seen through the glass bulbous part of the irrigator.

Doherty reported three cases of particles of rubber in the anterior chamber. In one of these "definite harm" was done. In the other two no irritation resulted.

However, the danger of introducing small bits of rubber from the inside of the bulb should also be borne in mind when a Bell erisophake is used. The prevention of such an occurrence would be the thorough rinsing of the interior of the bulb with sterile saline solution just before use.

Mukai, in 1926, was apparently the first to observe and report a case of cotton thread embedded in a secondary cataract. It oc-

curred in one of Elschnig's patients. It was left there and caused no irritation. He also observed two other cases in another clinic that were analogous. One of these showed a cotton thread beneath the bulbar conjunctival wound that produced ocular irritation until it was removed.

Purtscher, in 1939, reported six cases of cotton threads in the anterior chamber after intracapsular cataract extraction. There were almost no signs of irritation in any case except for a moderate congestion of iris vessels in the immediate neighborhood of the threads in two cases, and in one case there was a small amount of serum extravasated around the thread which later appeared as connective tissue.

In the third volume of Vogt's *Slit-Lamp Microscopy* (1942) there is an illustration of a case observed by him of two threads in a secondary cataract following extracapsular cataract extraction. A mild chronic iritis was provoked by the foreign material. The illustration shows two curling threads covered and ensheathed by a brownish, furry deposit. After one year there was no inflammation, the threads were still partly pigmented, and the vision remained 6/6.

Gürtler, in 1949, reported 26 such cases out of approximately 1,500 cataract extractions during a three-year period. In 24 of these the cataract had been removed in the capsule. One case occurred in an eye after an Elliot trephination for glaucoma. Follow-up examination showed that the cotton threads in the anterior chamber are tolerated by the eye without irritation. The postoperative iritis that developed in two of his cases (both intracapsular) he attributed to the operation. In both cases the iritis subsided while the threads remained in the chamber. In a few other cases mild hyperemia of the vessels of the iris adjacent to the threads existed for a short period.

It is presumed that in all of these cases cotton threads got into the anterior chamber from the cotton sponges that were used to wipe the wound and conjunctival sac.

Case reports

Case 1

L. G., aged 71 years, a woman, had a hypermature cataract removed in its capsule from the left eye by forceps extraction, on December 13, 1947. She developed a mild postoperative iritis which subsided completely 17 days later.

On January 9, 1948, slitlamp examination showed pigment deposits on the anterior surface of the vitreous and two small pieces of cotton fiber adherent to the iris and surface of the vitreous. They were clotted with minute white fluffy exudate points. A posterior synechia was present in the involved area.

Five months later the iritis flared up and persisted for three weeks and produced an inflammatory membrane of the pupil and multiple posterior synechias. A successful capsulotomy was performed by Dr. Irving Puntenney with the final corrected vision of 20/30—1.

Case 2

L. S., aged 57 years, a man, had an extracapsular extraction of the left lens performed on November 6, 1948. The anterior chamber was irrigated with sterile saline solution and little cortex remained behind. The convalescence was prolonged as a result of chronic serous iritis that was moderately severe.

On the 10th day this eye was examined under the slitlamp and two cotton threads each about 4.0 to 5.0 mm. long were seen embedded in the capsular remnants (fig. 1). The eye was entirely quiet two weeks later.

A capsulotomy was performed 11 months later without event. The threads were not disturbed, and the resultant corrected vision was 20/30+1.

Case 3

R. K., aged 60 years, a woman, had a mature senile cataract removed intracapsularly on December 1, 1948, without event. Postoperative iritis occurred on the third day. It was moderate in severity and subsided in six days under active treatment.

Examination of the eye under slitlamp microscopy 16 days after the operation showed a small filament of cotton fiber lying partly on the iris and partly on the anterior surface of the vitreous at the 9-o'clock position. The thread was stippled with minute white fuzzy points of precipitates. The vision however was good (corrected to 20/30) and has remained so, in spite of moderate thickening of the anterior surface of the vitreous and some minute pigmentation of it.

Discussion

The experience of these three cases resulted in an extensive investigation of the source of the cotton threads. The swabs or sponges used were of the compact "felt cotton" material used by brain surgeons. It is believed that cotton fibers from these sponges

were not likely to be separated from their matrix.

It was noticed, however, that many particles of lint could be seen floating in the beam of the operating lamp, sometimes almost in a cloud and especially prominent when the people around the operating table moved. It was also noticed that the syringes loaded with the saline irrigating fluid contained floating particles of lint when seen against the bright light.

The condition was so alarming that help was sought from other members of the staff of Passavant Memorial Hospital and from the engineers and from the supervisor of the laundry. Dr. Harrison Mehn, surgical fellow, Dr. Edward Bigg, and Dr. Opal Hepler, members of the attending staff, performed the following interesting study of the problem, not yet published. I am much indebted to them for permission to cite their work.

Lint counts of the air were made before and after treating the linen (drapes, towels, and gowns) by placing it in oil in the rinse water during the laundering. The lint counts were made in the same manner as pollen counts.

A very thin layer of white vaseline was placed on a standard microscope slide, this in turn was placed on a small wooden block (smaller than the slide) and the slides were placed in seven different positions in three operating rooms. These positions were on the Mayo table, on the instrument table, on the anesthesia table, the stool at the door side of the room, window sill, east and west sides of the operating room.

The slides were changed after each operation. The time of the operation, the type of operation, the number of people in the room were recorded so that the counts for the same type and length of operation could be compared.

The number of lint fibers was counted under the low power of the microscope, and the slide was crossed four times to give an estimate of the number of lint fibers in one cubic yard of air.

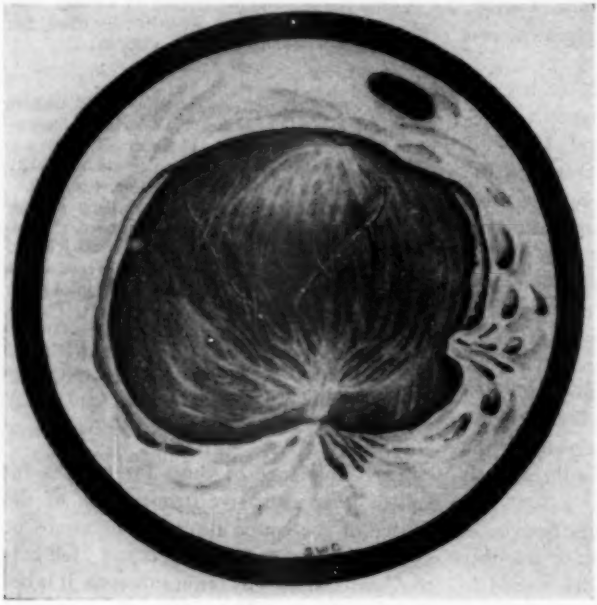

Fig. 1 (Vail). Lint in the anterior chamber (Case 2).

An initial control period of one week was used. Following this the walls of the operating room were oiled. This had no appreciable effect upon the count. The linen was then oiled and another series of determinations made. The count was repeated three weeks later.

The results were reasonably consistent and showed that the slide nearest the operating table had the highest count (140 average), but that frequently the next closest was not the next highest because of drafts caused by opening doors and by air conditioning.

When linen treated with oil was used little change in the lint count was noticed, although the individual fibers were markedly reduced in size. Lint counts made during the 12-hour night period were uniformly lower (25-50) than the lowest counts made during a daytime period.

Bacterial counts made in conjunction with the lint counts showed only meager growths of bacteria; the Staphylococcus albus type predominated, with only scattered instances of Subtilis. Colonies per agar plate varied from 15 to 90 per two-hour exposure. The highest counts were uniformly for the earliest two-hour period of the day.

It is seen by this experimental study that the problems of airborne lint and airborne dust infection in ophthalmic surgery, as was so ably shown by M. H. Post, Jr., before this society in 1945, are quite similar. Post concluded that covers should be kept on all solutions and instruments as much as possible. He advised treating all blankets and drapes with some sort of oil solution and mentioned that used by Harwood, Powney, and Edwards. The operating room floor should be treated with some type of dust-allaying preparation.

The advice of Ralph M. Tovell, M.D., of the Hartford General Hospital was then sought. He advised that the laundry use a paraffin-base waterproofing material, such as Migasol P. J. (Ciba), upon drapes, towels, and gowns—in other words, on all operating room linen not used to absorb moisture. Migasol P. J. is added to the wash wheel after the machine is loaded for the last rinse. The Hartford Hospital formula calls for one pint of Migasol P. J. for each 100 pounds of linen in the wash wheel.

It is too soon for us to judge the efficacy of this treatment. The problem, therefore, is still present. Free lint floating around the operating table settles on exposed instruments, solutions, sponges, and even on the exposed eyeball. Solutions and instruments should be kept covered until the last minute before use.

The instruments should be rinsed in boiling water, zephiran (1:5,000) solution, or washed with a stream of sterile saline before being inserted into the eye. The suture material must be minutely inspected just before insertion. Rapid movements of the hands or arms of the personnel in the operating room should be minimized. A current of air either from movement of people, the opening of doors, or from the air conditioning system stirs up the lint from the linen in clouds. Particular care must be taken to ensure that the solution used for irrigation of the anterior chamber is entirely free of lint.

Summary and conclusions

1. Cases of foreign material accidentally inserted in the anterior chamber during intraocular surgery have been described.

2. This foreign material consists of (a) cilia, capable of producing epithelial cysts or epithelial pearls. Every precaution must be taken to insure that no cilium or piece of one is in the conjunctival sac at the time of opening the eye. (b) Talc from rubber gloves, capable of producing granulomatous lesions and iritis. This is avoided by holding the gloved hands beneath a stream of sterile saline before operating. (c) Oil droplets from ophthalmic ointments, which may be inert but may remain as a source of iris irritation for many months. This is avoided by not using ointments postoperatively. (d)

Pieces of rubber from inside an irrigating bulb. This can be avoided by using the syringe with metal irrigating tip devised by Heath. A glass tip can be dangerous. (e) Cotton fibers from sponges and swabs. The use of "felt cotton" will minimize the danger of loose fibers entering the eye. According to the literature and, as a rule, such fibers do not produce any irritation. Occasionally hyperemia of the iris is seen. (f) Cotton fibers (lint) free in the air, arising, from the operating room linen and settling on exposed instruments, solutions, and onto the eyeball.

3. Three cases of free lint getting into the anterior chamber either by the irrigating fluid or the instruments inserted into the eye during the operation are described. In each case moderately severe iritis developed, resulting in posterior synechias and an inflammatory pupillary membrane in one instance, necessitating needling of the membrane.

4. The iritis present in these cases, in contrast to the few occurrences reported as the result of fibers from cotton swabs, may have been coincidentally more severe, but there is also the possibility that bacteria, airborne with the lint, may have been responsible. Further study and observation are necessary.

5. The problem of the control of airborne lint is still unsolved. Methods to control it have been suggested, but the results are not as yet satisfactory.

6. It is hoped that a discussion of this problem will draw attention to this serious state of affairs and result in further work to solve it.

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GLAUCOMA ASSOCIATED WITH POLYCYSTIC KIDNEY DISEASE

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Glaucoma associated with polycystic kidney disease is not prominently featured in the literature.

Since the case report is the foundation of clinical medical literature, the report of a case of this nature with a brief discussion of some of its etiologic possibilities would appear to be in order.

REPORT OF CASE

A. E. L., a white man, a bookkeeper, aged 52 years, was admitted to the U. S. Naval Hospital, St. Albans, New York, with a diagnosis of diffuse glomerulo-nephritis. His chief complaint was rapid loss of vision.

History. A complete history could not be obtained from the patient due to his drowsy and partially disoriented condition. However, the following significant and reliable information regarding his case was obtained from his wife and from his family physician.

For the past year the patient had experienced intermittent painless hematuria and low back pains. Fourteen days prior to admission he experienced rather sudden loss of vision in the left eye. There was no associated ocular pain. Over a period of days the patient grew increasingly drowsy. Hematuria developed during this time and was pronounced upon admission to the hospital.

The patient was treated for arterial hypertension, degree unknown, six years prior to hospitalization. For several years his wife thought that he had some visual difficulty. This could well have been of a refractive nature or due to presbyopia. There was no history of syphilis, edema, or coma.

The patient had no children. Both a brother and a sister had died in middle age of polycystic kidney disease. The affected brother had also experienced severe impairment of vision during the terminal stages of his illness.

Physical examination. The patient was apparently well developed and attempted to cooperate but was drowsy, disoriented, and at times incoherent. His skin was dry, sallow, and pasty in appearance but not jaundiced. The pulse rate was 80 beats per minute, temperature 100°F., and respiration was 20 per minute.

Eye examination could not be thoroughly accomplished due to the patient's inability to coöperate. These findings were noted:

Vision was: O.D., counting fingers at one foot; O.S., no light perception.

There was partial ptosis of the left upper lid, otherwise the lids were normal. The extraocular muscles were intact. The lacrimal apparatus and the conjunctivas were normal. The corneas were transparent and showed normal luster.

Both pupils were round, equal, and partially dilated. The right pupil reacted to light but poorly to accommodation. The left did not react to light or accommodation.

Ophthalmoscopic examination revealed the aqueous and vitreous to be clear. The lenses were normal in appearance. The fundi were clearly visualized. The right optic disc revealed sharply outlined margins, deep generalized cupping, and an abnormal lemon-yellow color. The retinal arteries contained areas of mild spasticity and slight arteriovenous indentations and some generalized attenuation.

The retina was otherwise clear and normal in appearance. There were no hemorrhages or exudates. The left fundus presented an appearance similar to the right except that the optic-disc changes were more pronounced.

Tension measured by Schiøtz's tonometer was 18 mm. Hg in each eye. The visual field of the right eye was limited to a small area in the upper outer quadrant.

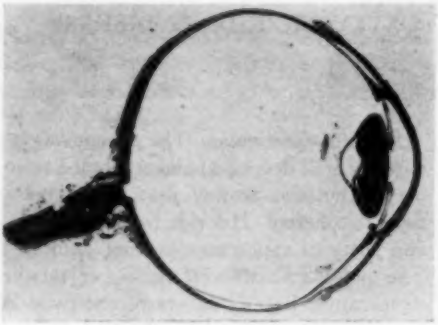

Fig. 1 (Berkley). Photomicrograph of cross section of globe, with globular posterior section, relatively small cornea, and pronounced generalized thinning of the sclera.

Physical examination. The teeth were in extremely poor condition, containing many caries and much gingival infection. The ears, nose and throat were normal. There was no generalized glandular enlargement. The lungs were clear. The heart was normal and the pulse was full and regular. The blood pressure was 122/78 mm. Hg.

The abdomen was soft but contained a readily palpable, tender, large, irregular, but poorly defined mass in the left lower quadrant. The liver was enlarged, smooth and slightly tender.

The remainder of the physical examination, including genital, rectal, and neurologic studies, revealed no abnormal findings.

Laboratory examination showed the following positive findings:

Red blood count, 2,500,000—white blood count, 17,000, with a differential count of 94-percent segmented neutrophils, four-percent lymphocytes, and three-percent monocytes. The Kahn test was negative and the sedimentation rate was 35 mm. in one hour.

The N.P.N. was 151 mg. per 100 cc. of blood and the CO_2 combining power was 15 vol. percent. A urine specimen was grossly bloody, heavily loaded with albumin, and had a specific gravity of 1,009.

A flat roentgen plate of the abdomen revealed a kidney-shaped mass of approximately 4 by 6 by 7 inches extending downward from the level of the 12th rib on the left side.

Skull plates showed areas of increased as well as decreased densities. The areas of decreased densities were numerous and presented small, O-shaped, punched-out appearances.

Studies at this point suggested as a most likely diagnosis either polycystic kidney disease or hypernephroma with metastases.

Cystoscopic studies revealed no urethral obstruction. The bladder was filled with old blood clots and bloody urine. The left ureteral orifice contained a plug of clotted blood. The right orifice was normal in appearance.

Retrograde visualization of the kidneys showed both to be abnormally large, with the left about twice the size of the right. The urologist stated that the left kidney, seen by itself, would appear to contain a malignancy but, when compared with the right kidney, polycystic kidney disease would seem to be the most likely diagnosis.

During the remainder of his hospital stay, the eye findings did not change from those present on admission. The intraocular pressure remained at 18 to 20 mm. Hg (Schiøtz), and no retinal hemorrhages or exudate developed.

The patient's general condition deteriorated rapidly with N.P.N. continuing to rise rapidly, reaching at one time the phenomenal figure of 600 mg. per 100 cc. He died on the 14th day of hospitalization. Clinical impressions at time of death were: (1) Uremia and renal failure due to polycystic kidney disease, and (2) blindness, possibly of central origin due to uremia or optic atrophy.

Postmortem examination. The points essential to an ophthalmic study of this case are briefly enumerated.

The kidneys were extremely enlarged, the right weighing 2,370 gm. and the left 1,250 gm. They were grossly similar, both being nodular, multicystic, and blue-gray to dark red in color. They presented the typical picture of polycystic kidneys.

The left kidney yielded a positive culture of alpha streptococci and proteus vulgaris. The liver also contained many cysts.

The eyes were removed and placed in Bouin's solution in preparation for special pathologic study by Dr. J. Arnold deVeer of Brooklyn. Upon completion of the study, Dr. deVeer returned the following comprehensive report:

GROSS. The material consists of two rather large but otherwise grossly normal eyes and an entire optic chiasm.

MICROSCOPIC. Both eyes show the same findings. Both are of the same size and contours and are almost identical in all histologic details.

There is generalized ectasia of the scleras which gives rather broad, globular posterior segments. In both there is flat recession of the optic discs which is accompanied by ectasia of the posterior scleral foramina and some distortion of the nerve at the level of the stretched lamina cribrosas.

The retinas are very little detached by artefaction of fixation and subsequent handling. This suggests a firmer attachment than usual, as is usually the case in glaucoma. No definite adhesions of the retinas are detected. There is no active inflammation in any of the tissues.

The only other abnormalities are the following: Slight encroachment of conjunctival vasculature and connective tissue on the corneas (slight peripheral degenerative pannus); an unusually compact structure of the angle tissue; absence of anterior synechias and, instead, recession of the roots of the irises behind the level of Schlemm's canals; unusually long, slitlike canals of Schlemm; relatively small corneas for eyes of this size.

Fig. 3 (Berkley). Photomicrograph showing typical glaucomatous cupping of the nervehead. Ectasia of the sclera, and especially of the lamina cribrosa, has resulted in marked widening of the intervaginal space.

Fig. 2 (Berkley). Photomicrograph, showing free and open chamber angle and the large open Schlemm's canal.

Both lenses appear normal. The optic chiasm was mordanted in chrome salts and stained by the Weigert stain for myelin. Sections in the horizontal midline show no demyelinization.

The interpretation of these changes is not easy. It seems obvious that there have been glaucomatous changes in both eyes, possibly on the basis of structural abnormalities in the angle tissue. The cupping of the disc seems definitely attributable to glaucoma with stretching of the lamina cribrosa and widening of the base of the intervaginal space in each eye.

Comments

It is submitted that this represents a case of glaucoma resulting from congenital structural defect of the sclera in which the globe could not tolerate a normal tension without pathologic damage of the type resulting from hypertension in normal eyes. The case is presented for its interest as a case of glaucoma resulting from congenital structural defects with the same underlying etiology as those causing the polycystic kidneys.

Although studies and pathologic findings suggest that the structural defects involving the eyes, kidneys, liver, and skull probably had a common congenital origin, an extensive but incomplete search of the literature does not reveal other similar cases suggesting such a connection.

The nearest reference to a possible pathologic connection between glaucoma and polycystic kidney disease is suggested by Fuchs* when he speaks of cases of uremic amaurosis associated with albuminuric retinitis.

Perhaps some cases placed in that category could have represented the type of condition presently under discussion. It seems probable, however, that this type of structural defect should be listed as another one of the many causes of the glaucoma syndrome.

In this presentation we apparently see a case of glaucoma due not to increased intraocular pressure above that found in normal eyes, but rather due to generalized ectasia of the sclera which has resulted in an inability of the affected globe to withstand a normal intraocular pressure.

The clinical syndrome such as the one herewith presented, although showing structural defects involving a number of organs including the eyes, naturally passes under the designation of polycystic kidney disease because of the overwhelming importance of the renal aspect of the condition.

However, the question may well be asked, might it not be possible and indeed probable that in some cases the structural defects of the eyes are the prominent features with the kidneys only slightly affected? And if such should be the case, then could not some cases of this type, which in the past have passed as so-called low-tension glaucoma, in reality represented congenital structural defects of the sclera associated with the syndrome under discussion?

The possibility that a previous abnormally high tension may have accounted for the findings presented in this case report cannot be wholly discounted.

A.P.O. 676, c/o Postmaster, New York.

*Fuchs, E.: Textbook of Ophthalmology (Duane). Philadelphia, Lippincott, 1917, ed. 5, p. 579.

Ophthalmic Miniature

In all ophthalmias in which the discharge is greenish or livid and in which there is sleeplessness as well as severe pain in the temples, there is likely to occur ulceration of the eyeball. In all such cases, perforation may follow.

Hippocrates, circa 400 B.C.
From the translation by Francis Adams.

THE RELATION OF PERCEIVED SIZE OF HALF-IMAGES AT THE FUSION LEVEL TO PROJECTION ON THE HOROPTER*

Its importance in aniseikonia and heterophoria

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I. Introduction to the horopter projection-size theory

Two questions about the theory of aniseikonia are delaying its general acceptance as a clinical treatment. First, how can such small amounts as one-percent difference in retinal image size cause discomfort? Second, how can one-percent size difference be important when, in normal oblique near gaze, there may easily be 15-percent retinal aniseikonia due to different distances of the target from the right and left eye? Ludvigh's[1] 1936 criticism has not yet been answered, except in terms of "psychology of vision" which is too vague.

The theory that aniseikonia is not related to the size of the two retinal images, but to the relative size of the half-images at the cerebral level where fusion takes place is not new. What is new about the theory to be developed in this paper is that the image size at the cerebral level can be predicted from the retinal image size, the position of gaze, and the state of innervational balance of the eyes for convergence against divergence. The clinical importance of this theory should be obvious.

The theory assumes that the size and shape of images on the plane in the cerebral cortex, where perception and fusion take place, are not proportional in size and shape to the images on the two retinas, but are proportional to such images after being projected from the retinas through the nodal points of the eyes onto the horopter.

This does not mean that the two half-images themselves (such as those in physiologic diplopia) are localized in space at the distance of the horopter. Such depth localization of unfused images depends on a host of monocular clues. The theory may mean, however, that the relative size of such half-images may be altered to promote fusion.

II. The horopter deviations[2]

The horopter is a surface to which images are referred somewhere in the cerebral cortex, but which is functionally projected as a vertical cylinder before the eyes. It can be demonstrated in individuals having binocular vision in all conditions of gaze, ametropia, and heterophoria.

For illustration, one may think of the ordinary office perimeter with the arc placed horizontal as a typical horopter surface. The subject's two eyes must remain fixed on the central spot from a distance of 666 mm.; that is, the eyes are on the circumference, not the center of the arc.

Any object in space nearer or more distant than this surface from the eyes will be seen in physiologic diplopia. Objects placed exactly on the horopter surface are seen singly, or fall on retinal corresponding points. Objects not exactly on the horopter, but within the distance limits of Panum's fusional areas (fig. 1-e) which increase peripherally due to poor visual acuity, will be seen singly.

If the physiologic diplopia of such objects is crossed, the stereoscopic depth clue is that the object is nearer than the horopter surface. If the diplopia is uncrossed, the depth clue is more distant.[3]

Subjectively, all objects on the horopter appear to be on a frontoparallel plane, not an arc. Objects placed to appear in a straight line, even in trained subjects, are objec-

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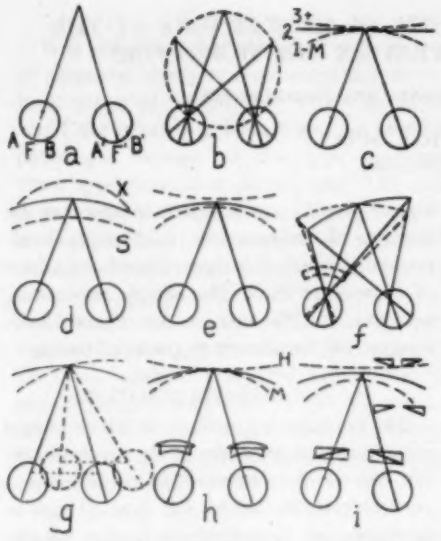

Fig. 1 (Miles). (a) To construct the theoretic horopter, mark off corresponding points equidistant from the fovea.

(b) Lines from such points drawn through the nodal points are localized on the Vieth-Müller Circle. Lines from any point on the circle through the two nodal points will strike retinal corresponding points.

(c) Subjectively, the horopter determined by placing vertical line targets to appear in a frontal plane through the fixation point is less curved than the Vieth-Müller circle especially beyond two meters' fixation distance.

(d) In natural uncorrected exophoria where convergence innervation tone is decreased, there is fixation disparity or retinal slip. The result is a horopter of steeper curve more distant from the fixation point. With increased convergence innervation, fixation disparity reverses, and the horopter approaches nearer than fixation.

(e) The dashed lines mark the limits of Panum's fusional areas in which physiologic diplopia is not recognized as such, but elicits stereopsis.

(f) The solid lines illustrate the horopter rotation in uncorrected aniseikonia. Broken lines show correction with an afocal magnifier.

(g) In asymmetric convergence, the horopter rotates on the fixation point. In Figure 1-b, fixation can move to any point on the Vieth-Müller circle without changing the relative distance of corresponding retinal points from the foveas. The horopter rotation is correctly predicted.

(h) In corrected hypermetropia, the horopter curve flattens, while in myopia, it is more steeply curved.

(i) Distortion and displacement of the horopter from flat prisms.

tively curved except at a distance of one to two meters, which varies individually. At a lesser distance, the horopter concavity is toward the eyes (fig. 1-c). This may be related to the concavity of the horopter in exophoria (fig. 1-d), since exophoria is physiologic in near vision.

The horopter concept began with Aguilonius[4] in 1613, and was developed by Vieth (1818) and Müller (1826). Subjective determinations were made by Panum (1858), Hillebrand (1893), Tschermak (1900), Fischer (1924), Herzau (1928), Ogle[5] (1932), and many others.

Vertical line targets mounted on grooves radiating from the eyes were found most practical. It is significant that tests for stereopsis and aniseikonia are modified horopter tests, consisting of the judgment of comparative distances of vertical lines.

Proceeding from the horopter defined as the point of crossing of lines of projection from corresponding points of the two retinas through the nodal points, one might predict, as Vieth and Müller did, the general shape of the horopter surface.

In Figure 1-a, one might mark off on the reduced eyes the points assumed to correspond, being equidistant from the fovea on each side: AF = FB, and so forth. Then Figure 1-b is the result of drawing lines through the nodal points from such corresponding points. The circle connecting the fixation point, the points of crossing of lines of projection, and the nodal points is called the Vieth-Müller circle.

In life, the corresponding points of nasal and temporal retina are functionally asymmetrical, so that the horopter would be constructed less curved (fig. 1-c). If one knew the degree of retinal asymmetry, tested, for instance, by dividing a horizontal line in two equal parts monocularly (Kundt, 1863), one could construct a horopter to conform to that found in subjective tests. Similar conformity of constructed and subjective horopters can be demonstrated in case of heter-

ophoria, aniseikonia, oblique near gaze, corrected ametropia, and plane horizontal prisms (fig. 1-d, e, f, g, h, i).

The horopter, then, is not a theory, but a basic phenomenon of binocular vision on which all stereoscopic depth judgments, size judgments, eye movements, and fusion depend. Horopter and stereopsis phenomena are innate and may occur immediately after operations for heterotropia. Only the width of Panum's fusional areas is changed by orthoptic training.

The horopter in oblique near gaze (fig. 1-g) was studied by Herzau[6] (1929) and Ogle[5] (1932). If the criterion for subjective determination of the horopter remains the frontal plane, the result is rotation of the horopter through the fixation point. This effect of rotation can be seen in Figure 1-b by shifting the point of bifoveal fixation from symmetrical to asymmetrical convergence along lines that once arose from peripheral retinal corresponding points. Other corresponding points equidistant from the two foveas in the new position determine other visual lines which cross on the Vieth-Müller circle. This horopter rotation through the fixation point will be discussed and applied later.

Ames and Ogle[3] first noticed the effect of heterophoria to displace and distort the horopter (fig. 1-d). The horopter, then, does not have to lie on the fixation point. Its position depends on the innervation tone for convergence. If tone is weak, causing exophoria, although it is equalled and counteracted by fusion, the horopter is displaced away and is more steeply curved. If convergence innervation is strong, the horopter approaches and flattens.

Lines originating in peripheral corresponding points may deviate laterally in exophoria due to fixation disparity[2] or retinal slip of foveal fusion. If the peripheral lines tend to separate, the points of crossing move more distant from the eyes. When the foveal slip is toward esophoria, the lines move together, moving the crossings more proximal.

Therefore, on observing a departing object there is decreased convergence tone so that the horopter floats on ahead of fixation. On observing an approaching object, increasing convergence tone forces the horopter ever nearer (fig. 4-e). Such a mechanism was predicted by Aell[7] (1908) who found that the apparent distance of the momentary fixation point influenced perception of depth.

The effect of uncorrected aniseikonia on the horopter is illustrated in Figure 1-f. The horopter rotates through the fixation point so that the end approaches the eye whose image needs magnification. At 10 feet, one-percent aniseikonia will rotate the horopter 23 degrees; at 20 feet, rotation is 41 degrees.[8] In the figure, the dashed lines show the correcting effect of magnification to make the horopter on that side recede.

The horopter is also displaced by ordinary lenses correcting ametropia.[9] Minus lenses make the horopter more steeply curved, while plus lenses tend to flatten or reverse the curve (fig. 1-h).

Flat prisms used in correcting phoria displace and distort the horopter so grossly that they frequently interfere with fusion.[10] The distortion is illustrated in Figure 1-i. It is interesting that experience with prisms used to correct horizontal phoria is more successful with those (base-in) which tend to flatten the horopter and correct exophoria. Base-out prisms are not frequently used, and would tend to steepen the horopter deviation.

It may need mentioning that if a horopter is distorted or rotated a certain way, an objectively undistorted unrotated target, such as a plane wall, would be seen distorted or rotated in the opposite sense. Thus, Ogle states (reference 2, page 149) that the effect of base-in prisms on an objectively flat frontal surface is to make it appear convex toward the eyes.

Perhaps lenses and prisms should be de-

signed which in ametropia and heterophoria would tend to correct the horopter shape. We know now by experience with aniseikonia that it is important to design lenses in anisometropia which prevent the rotation of the horopter on the fixation point.

III. Evidence that perceived size is not proportional to the retinal image size

1. Nearly everyone has had the experience, while looking through a window at the sky, that an insect enters the monocular fringe of the binocular visual field on the window pane. Seen thus, the insect is localized at the point of fixation at far distance, so that the insect appears to be a large flying machine. With bright illumination, the pupil of the eye increases depth of focus to make the image of the insect quite sharp. Only when the insect enters the binocular field so that disparity clues occur, does it resume natural size and its proper location.

2. A similar phenomenon occurs binocularly when only one object can be seen in the visual field. Being only a relative thing, stereopsis can only give accurate localization of one object in relation to another. Convergence alone is a very poor depth clue.

Therefore, an illuminated tennis ball suspended in a dark room cannot be localized binocularly. If the subject is told that the ball is for ping-pong, it will appear quite near. If for softball, localization is at great distance. Such error does not occur in ordinary life, except perhaps under extremely dark conditions.

3. Size constancy. The fact that size perception is not proportional to the retinal image size was first clearly stated by C. Ludwig[11] (1852). He found that "objects perceived at equal optic (visual) angles up to certain (distance) limits continually enlarged with the distance from the eye." This size constancy was confirmed by P. L. Panum (1859), E. Hering (1861), E. Emmert (1883), G. Mayerhausen (1891), and many others.

To observe size constancy, move your hand from near the face to arm's length. Although the visual angle and the retinal image size continually decrease, the perceived size remains the same or larger. On the contrary, an after-image obviously maintains the same retinal image size, but appears small on a near surface and large on a distant surface.

4. Kundt's partition experiment has been mentioned. The opposite (Munsterburg) nasal-temporal retinal asymmetry occurs, particularly in myopes. The angle kappa is decreased or reversed, and the horopter curve steepens.

5. A distance similarly imaged on lower retina appears to be larger than one imaged on upper retina according to Feilchenfeld[12] (1902). A vertical distance is perceived greater than an equal horizontal distance (Seashore,[13] (1900).

Thouless[14] (1938) reported that on viewing a circular disc obliquely, it appeared more circular than warranted by its actual visual angles in the two meridians. The disc should appear more oval.

7. The perception of incomplete pictures is in more detail than the retinal image. Cartoons successfully portray emotion and drama. If a horizontal wire is viewed monocularly so that it falls in the center of the blindspot, no defect in the wire can be seen. This fact delayed the acceptance of Marriot's discovery of the blindspot.

8. Finally, as the moving eyes palpate a scene, the retinal images must dance about in crazy fashion. However, perception of the scene is static unless the eye movement is caused by such unnatural force as finger pressure on the eye, or strong vestibular stimulation. Perception is sufficiently independent of retinal images that defects of retinal images are not transferred.

Conclusion

Such visual phenomena and others to be described in Part VI of this paper have until now successfully prevented the acceptance of any projection theory for explanation of

binocular vision. To get visual phenomena out of the illusion or psychic realm into the physiologic is always a great advantage. The concept of image projection on the horopter, and the influence of convergence innervation tone to displace the horopter from the fixation point, would seem to accomplish this.

IV. Bielschowsky's proprioceptive theory of object size

Bielschowsky[15] (1935) suggested that proprioceptive impulses arising in the extraocular muscles while moving the eye from one end to the other of an object might aid in perception of size. He further stated that corresponding pairs of retinal areas in the two eyes have their own innervational value, depending on their distance and direction from the fovea. When such a pair of areas is stimulated to the point of attention, accurate eye movements occur by reflex action, to place the image on the fovea with the least motion. He believed that asthenopia might arise from ambiguous innervations from falsely corresponding points so nearly equal as to maintain rivalry.

This theory conflicts in no way with the one to be discussed here.

V. The contribution of Polliot

In a series of articles from 1921 to 1927, Polliot[16] explained how size perception of images in physiologic diplopia is related to projection of the retinal image through the nodal point of the eye onto the horopter. He did not realize that convergence innervation without the act will displace the horopter and did not apply his discovery to other visual phenomena which fit the theory so nicely.

VI. Illustrations and applications of the horopter projection-size theory

1. Physiologic diplopia (Polliot)

This phenomenon is very striking and can be produced very simply. As illustrated in Figure 2, fix binocularly on a pencil point at about six inches' distance and observe the diplopic images of a small ruler held at about 10 inches (the mm. rule for pupillary distance). The background should be a dark surface. Notice how small the ruler appears, compared to its true size upon direct fixation.

Although the ruler subtends the same visual angle at the nodal point in both instances, the perceived size varies about 20 percent, as illustrated in Figure 2-A and B. With fixation on the pencil point, convergence tone is strong, the horopter approaches near, and the projection of the retinal image through the nodal point onto the horopter is consequently reduced in size. Upon fixation of the ruler, convergence is relaxed, the horopter moves away, and the size appears normal.

Figure 3 illustrates fixation on the pencil tip at about 10 inches, but the ruler is seen

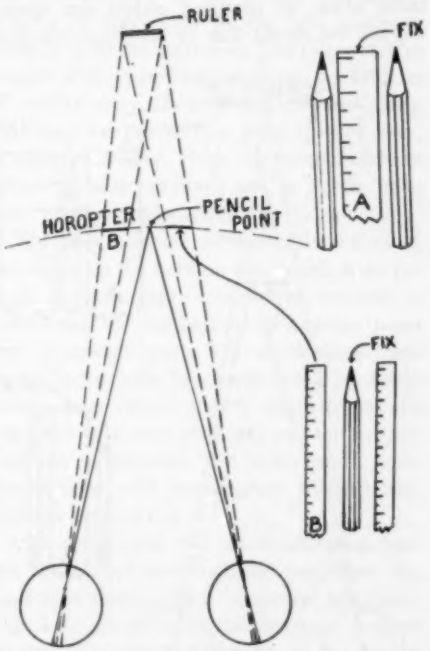

Fig. 2 (Miles). Subjectively the ruler appears much smaller (B) when the pencil point is fixed than (A) when the ruler is fixed. Retinal image size in both cases remains practically constant. The projected areas (B) on the horopter are reduced about 20 percent in size.

in crossed diplopia at about six inches. Here convergence tone is less, the horopter is more distant, so the projection image size, A, is enlarged compared to that in direct fixation of the ruler where convergence is greater and the horopter nearer, B.

As further evidence that the size changes depend on the degree of convergence tone, repeat the experiments while looking through base-in and base-out prisms. Forcing convergence increases the micropsia, while relaxing convergence increases macropsia of images seen in physiologic diplopia on extrafoveal retina.

2. The tennis-ball experiment

Size constancy depends in part on past experience with objects of known size. Figure 4 shows the effect of changing object distance alone, or changing object size alone. Figure 4-a shows that as an object changes distance from the nodal point of the eye, its retinal image changes proportionately. One would expect that in change of image size, Figure 4-b, the image would remain at the same subjective distance, and simply appear enlarged. Such is not the case.

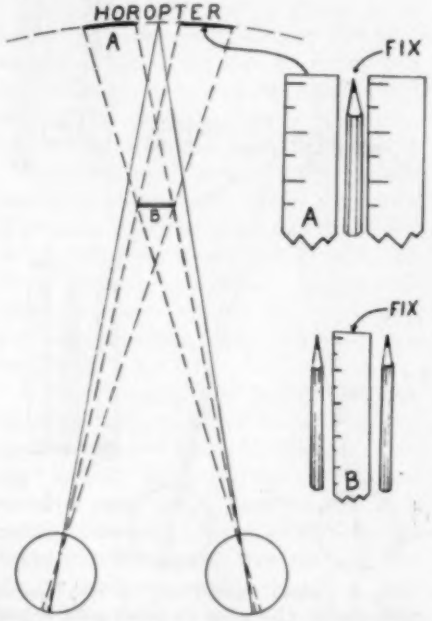

Fig. 3 (Miles). On fixation of the pencil lead, the diplopic images of the ruler appear 20 percent or more larger than the image upon direct observation (B). The retinal image remains the same size.

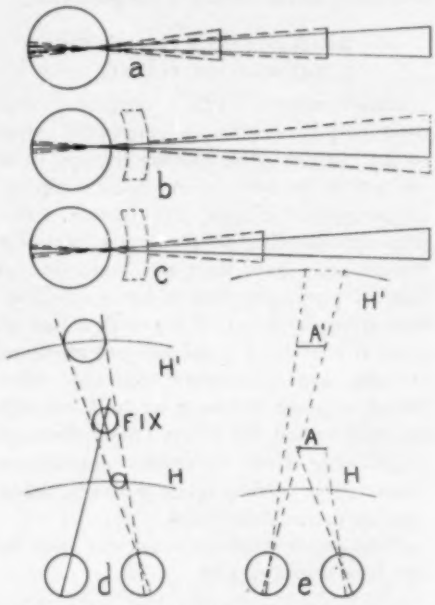

Fig. 4 (Miles). (a) A receding object casts an ever decreasing retinal image, but perceived size of the object remains constant.

(b) If an object is observed through a 200-percent (×2) magnifier, one might expect the subjective image to lie in the object plane, doubled in size.

(c) However, because of size constancy, the object does not appear changed in size. It is merely localized at half the distance.

(d) The tennis ball at (FIX) holds both foveal lines. Innervation to converge without the act moves the horopter nearer (H) when the ping-pong ball is suggested. Innervation relaxing convergence moves the horopter away (H) when a soft ball is suggested, causing appropriate change in perceived size.

(e) As the hand (A) approaches the face, the retinal image is large, but the projection on the horopter at (H) is small. Innervation to converge has moved the horopter quite near. As the hand (A) moves away, the retinal image becomes much smaller, but relaxed convergence makes the horopter more distant. The projection, upon which size perception depends, remains constant or larger, to neutralize the marked change in retinal image size.

Figure 4-c shows the experimental fact that the magnified image of the object remains the same subjective size, and moves to the position it would have to occupy if it were the size indicated by the magnified retinal image. With 200-percent (×2) magnification, the object appears the same size at half the distance.

Suppose that the objects in Figure 4-a are three playing cards. The nearest is objectively twice normal size, the middle card is normal size, and the distant card is half normal size. If such unequal-sized cards were placed side by side in the middle position, they would appear subjectively natural size and in the positions first held (if overlay, parallax, and stereopsis are prevented).

The tennis-ball experiment previously mentioned will work in most subjects binocularly as long as the ball alone is visible in a dark room. The mechanism of changing perception of distance and size with suggestion that it is a ping-pong ball or a softball must have to do with the effect of known size on convergence innervation tone. As suggested in Figure 4-d, the idea of a ping-pong ball makes the tennis ball appear nearby. Its nearness stimulates convergence tone,[17] making the horopter approach and the projection image size decrease.

Figure 4-d does not indicate suppression of the left eye. Both foveas remain fixed on the objective ball in spite of the degree of convergence innervation. As in Hering's[18] line of direction experiments, binocular vision is maintained and there is no diplopia. The ball stays in the subjective medial sagittal plane whether projected near or far. Retinal image size remains constant whether increased tone produces a near horopter, or decreased tone produces a far horopter. Polliot's phenomenon, then, applies also to macular images of any size larger than a point.

3. Perceived size constancy

Figure 4-e illustrates perceived size constancy when the hand, A, is moved from near the face to arm's length. Increased convergence tone makes the horopter approach, so that the projected image of the hand appears small in the near position, while loss of tone makes it appear large in the far position. This size change more or less neutralizes the marked change in retinal image size of objects moving from near to distance.

With departing or approaching objects of known size, this perceived constancy can be demonstrated out to 20 or 30 feet. Some individuals, although excellent in visual and stereoscopic acuity, are poor in size constancy. Renshaw[19] (1948) found that size constancy is affected in ametropia and heterophoria in a characteristic way.

4. The "moon illusion"[20]

The full moon appears decidedly larger at the horizon than at the zenith, yet photographs of the moon in the two positions show it to be the same size. The phenomenon occurs with experimental moons as little as 30 meters away. If one bends over and views the moon on the horizon with upward gaze, it appears smaller. Neck movements and the effect of haze, skyline, and so forth, have been proven noncontributory.

The only possible difference in vision of the moon on the horizon and zenith is on the basis of convergence innervation required to counteract the mechanical divergence present in upward gaze. This divergence must in all individuals be counteracted by fairly strong convergence tone,[21] which forces the horopter to a near position, and the projection size to decrease. The moon on the horizon is seen with convergence relaxed, and appears natural size.

One may object that this explanation does not seem consistent with the subjective deviation of the horopter in natural exophoria (fig. 1-d). In the latter, the horopter is more distant. There is a difference in the two in the degree of convergence innervation tone required. In natural exophoria with a distant horopter, the phoria is innervational and is the result of low convergence tone. In exophoria due to upward gaze, mechanical

pressure of orbits, muscles, and fascia on the eyes, great convergence tone is required.

5. THE KOSTER[22] EFFECT (micropsia from minus lenses, atropine, Rollett plates, prisms, and mirrors[23])

It has long been known that micropsia from minus lenses was not due to the lens because by Knapp's law, if the lens is placed at the anterior principal focus before the eye, no retinal image size change occurs. If the minus lens is nearer than about 15 mm. from the cornea, the retinal image is magnified. This can easily be demonstrated on the space eikonometer. If accommodation of the eye occurs, the nodal point of the eye moves forward, which magnifies the retinal image. Yet objects observed through minus lenses may appear as much as 10 to 20 percent smaller. This phenomenon occurs in everyday refraction.

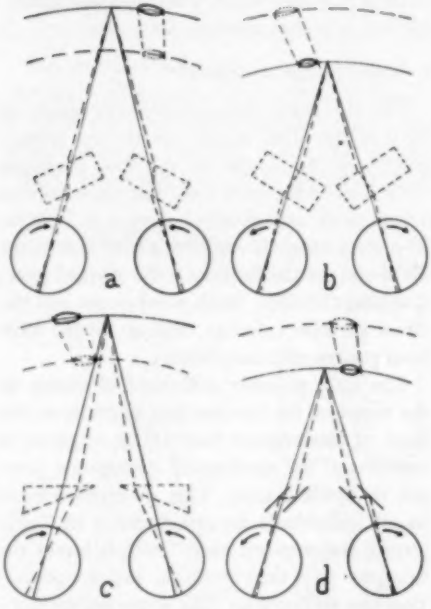

Fig. 5 (Miles). (a) Any mechanical means of changing convergence innervation tone while binocular vision is maintained on a fixed point will change perceived size. The size change occurs whether the object is on the fixation point, or elsewhere in space. In these drawings, the object and original horopter are shown in solid lines. Dashed lines show the horopter as changed, and the image size change. Projection may be from either eye, and the direction of projection has nothing to do with localization of the image in space. Rollett plates as indicated in (a) and (b) may enforce an increase or decrease in convergence tone. (c) Increased convergence tone decreases perceived size. (d) Convergence tone decreased by paired mirrors increases perceived size.

Such micropsia is best explained by the horopter projection size theory. If the minus lens stimulates accommodation, there is convergence innervation from the accommodation-convergence reflex. Such innervation moves the horopter nearer, so that the projection image size must decrease.

Atropine micropsia was first described by Aubert[23] (1865), when it brought forth controversy because it did not occur uniformly in all individuals. The effect is explained by attempts of some persons to accommodate in spite of the atropine paralysis. Such attempts activate the accommodation-convergence reflex to bring the horopter nearer. Those individuals who relax freely or give up attempts to accommodate observe no micropsia.

Freeman[24] (1930) found that some individuals with atropine micropsia reported the image more distant as well as smaller. He concluded correctly that the distance perception depended on known size of familiar objects as in Figures 6 and 7.

Eserine macropsia was reported by Tschermak (1930). For this, one must assume central inhibition of accommodation, accommodation being already overstimulated locally by the eserine. With inhibited convergence reflex, the horopter recedes, enlarging the projected image.

Rollett[25] (1860) described micropsia and macropsia from looking through pieces of thick plate glass rotated so that the medial edges approached or receded from the nose.

Figures 5-a and b show how such plates introduce changes in convergence tone, which move the horopter so that projected images are changed in size. Exactly analogous effects are obtained with prisms and mirrors,

Figure 5-c and d. In each case, the subjective micropsia is associated with increase in convergence, and macropsia with decrease in convergence.

6. Ames binocular versus monocular size-distance experiment

A. Ames, Jr.,[26] demonstrated in 1945 that a playing card in the form of a color transparency in the Clason variable size projector at a screen distance from the eyes of 10 feet could be made apparently to advance or recede in space by enlargement or reduction of objective size.

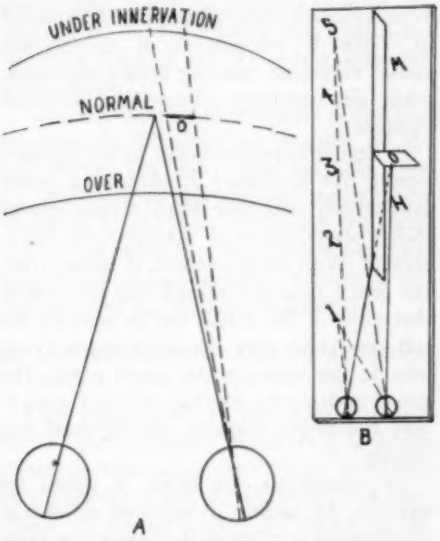

Fig. 6 (Miles). Although perceived size is increased with relaxed convergence, and decreased with overconvergence, the object O, is not localized in the direction of the displaced horopter. Size constancy in known objects localizes an enlarged O enough nearer to make the apparent size natural. A diminished O is seen normal size, but more distant.

In part B, the O is a natural-sized playing card. In relaxed convergence, it is perceived enlarged, and therefore localized on the plywood number scale nearer than 3. In overconvergence, the card is perceived small, and is therefore localized beyond 3. The eyes are at the near end of the 12-foot table so that only the right eye can see the playing card on the screen at 90 inches opposite plywood-figure 3. Both eyes see the plywood number scale to the left of the septum.

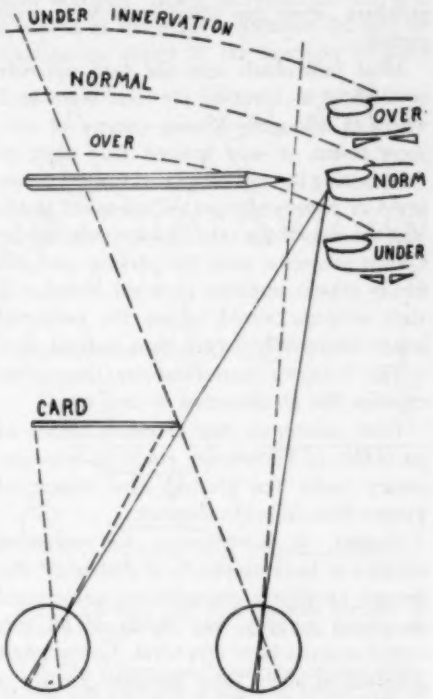

Fig. 7 (Miles). A simplified form of the Ames's experiment. The pencil replaces the playing card to be seen monocularly by the right eye, while the index finger replaces the row of plywood numbers. A card occludes the pencil from the left eye. In under innervation for convergence, the pencil is seen enlarged on the distant horopter, but because of size constancy is localized nearer in space, opposite the finger labelled "under." Persons having exophoria will place the finger too near when trying to place it in line with the pencil tip. The displacement is exaggerated by base-in prisms. In esophoria, the opposite displacement occurs.

For this effect, the screen must be invisible. Ames placed the screen on a 12-foot table (fig. 6-B), with a long sagittal partition so that it could be seen only by the right eye. On the left side in the binocular field of view were five large plywood numerals under illumination restricted from the screen.

The playing card was projected natural size on the screen at 90 inches, and the subject was asked to determine its subjective position in space on the scale of plywood

numbers. Free eye movements were permitted.

Most individuals saw the card opposite or slightly in front of plywood Number 3 where it belonged. Among dozens of subjects tested, it was noticed that most of those seeing the card displaced toward Number 4 or 5 were myopes. When asked to adjust the size of the card by manipulating the Clason projector until the playing card did finally appear opposite plywood Number 3, such subjects would adjust the projected image objectively larger than natural size.

The horopter projection-size theory can explain this phenomenon in two ways.

First, micropsia due to minus lenses of an object of known size could by size constancy make the playing card appear at greater than objective distance.

Second, it is common for corrected myopes to have esophoria at distance.[27] Although exophoria characterizes uncorrected or young myopes, two thirds of all corrected myopes have esophoria. Convergence innervation and a near horopter produce a small perception image. A small playing card must be localized at a greater distance.

In August, 1946, I tried the effect of prisms on my own perception of the position of the playing card on the Ames table. I was orthophoric, and did not wear glasses for my myopia of about 0.50 diopter. To make the playing card approach to plywood Figure 3, I had to enlarge it from the normal 8.9-cm. long diameter to 16.7 cm. From this position, prisms displaced the playing card on the plywood number scale as shown in Table 1.

TABLE 1

DISPLACEMENT OF PLAYING CARDS ON THE PLYWOOD SCALE

Prisms BO	Prisms BI	Plywood Scale	Target-Eye Distance (inches)	Card-Size Required (cm.)
1		3.6–3.8	106	9.8
	1	3.0–2.9	89	20.0
3		3.7–3.8	112	7.5
	3	2.9–3.0	85	25.0
7		3.4–3.2	98	11.0
	7	2.6–2.5	77	30.0

Stimulating convergence made the card appear smaller and more distant. Relaxing convergence made the card appear larger and nearer.

The experiment was repeated on Case 13449, a woman, aged 24 years, who was highly myopic: O.D., −7.0D. sph. ⊂ −1.5D. cyl. ax. 180°; O.S., −6.5D. sph. ⊂ −0.75D. cyl. ax. 160°. She had orthophoria by clinical test. With the card normal size, she localized it opposite scale number 4.5. When enlarged to 13.3 cm., it approached to Number 3 position. Base-in and base-out prisms showed slightly less effect than shown in Table 1. Stimulation of convergence causes micropsia, relaxing causes macropsia, while size constancy governs the perceived distance.

A similar experiment can be set up very simply. As in Figure 7, suspend a pencil horizontally with fine black thread several inches away from a homogeneous background. With the eyes about 15 inches from the pencil, place a card half way between so that none of the pencil can be seen by the left eye. Then, place the index finger to appear in line opposite the pencil point. The pencil replaces the playing card in Figure 6, and the finger replaces the plywood numerals.

In orthophoria, the finger is placed accurately. In natural or artificial exophoria, convergence is relaxed, the horopter is quite distant, so the projected pencil image is large, Figure 7. A known object such as a pencil is therefore localized too near. Therefore, the finger is placed too near when it appears opposite. See, Figure 7, the finger marked "under" convergence. Esophoric individuals project the pencil to a near horopter, judge the size too small, therefore localize it too distant, finger "over" in Figure 7.

In my own eyes, enforced convergence by one prism diopter displaced the finger position backward one inch. Five prism diopters displaced it to two inches, 10 to four inches,

and 15 to six inches. The same displacements forward were induced by prisms base-in, relaxing convergence.

7. The "monocular horopter" in heterotropia

Minus lens and atropine micropsia may be observed monocularly, which is surprising if due to overconvergence tone. Micropsia is observed monocularly through a "Greek telescope" which is merely a black tube about 20-cm. long and three-cm. in diameter. Kupfer[28] (1926) noticed that a child looking through the tube with the right eye turned the left eye inward, which suggests innervation to convergence in the absence of fusion. Indeed, the Polliot experiment (figs. 2 and 3), works very well monocularly.

One can theorize in esotropia a distorted horopter at the point of crossing of the visual lines (fig. 8-a), quite near the eyes. In abnormal correspondence, the horopter would be displaced away through the visual line of the anomalous fovea. One might expect micropsia in innervational esotropia and macropsia in the exotropic individual.

8. The Wheatstone-Panum phenomenon[29]

This phenomenon is described at length in the older literature. Nowhere is a simple plausible explanation found.[30] As illustrated in Figure 8-b and c, fix an object, A, binocularly. A similar object, B, placed in the visual line of the left fovea, therefore, can be seen only by the right eye. Stereopsis is impossible, so the object, B, should not appear definitely localized in space. However, the distance, d, between A and B is always exaggerated in all observers. The distance, d, is still exaggerated (fig. 8-c), if fixation is changed to B.

This paradox becomes exceedingly simple when interpreted by the horopter projection-size theory. When fixation is on the nearer object, A, convergence puts the horopter near. Object B is the size projected on the near horopter. Being decreased in size, it is localized at too great a distance. In case of fixation on object B, the horopter is more

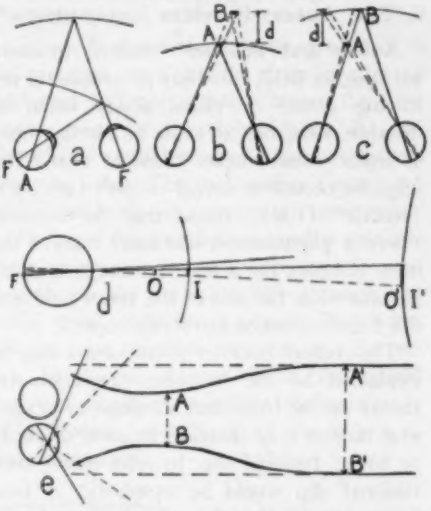

Fig. 8 (Miles). (a) The theoretic horopter in esotropia without and with anomalous correspondence.

(b) The Wheatstone-Panum phenomenon wherein both eyes are fixed on object A. Object B is not seen by O.S., so stereopsis and definite depth localization are impossible. However, B never fails to appear too distant, being perceived small on a near horopter.

(c) When B is fixed binocularly, A is seen the size projected on the distant horopter through B, and being enlarged, is localized too near. In both cases, distance, d, is exaggerated.

(d) In the Aubert-Foerster phenomenon, peripheral visual acuity is greater for near objects than for distant objects of the same visual angle and contrast. A blurred peripheral image does not stimulate accommodation like a foveal one does. The consequent lack of accommodation and convergence tone produces a distant horopter. Projection of a near object on a distant horopter is enlarged.

(e) An exaggerated sketch to illustrate the Hillebrand alley experiment, and the Pick visual field increase in near vision. Two rows of test objects adjusted to appear subjectively on the parallel dashed lines are found objectively nearer together at AB than at A'B'. Distance AB is large enough that when A is fixed, B is far peripheral. To adjust B, however, accommodation-convergence relaxes since B is on peripheral retina, and the Aubert-Foerster magnification occurs. When B is fixed, A is peripheral, so the same thing occurs. Peripheral retina is less involved at distance, where A'B' is perceived the size projected on its own horopter.

distant, the projection of A is enlarged, making A appear too near. In each case, distance, d, is exaggerated.

9. The Aubert-Foerster phenomenon[31]

Aubert and Foerster[32] noticed to their surprise, in 1857, that tests of peripheral resolving power or visual acuity taken at distance were not as acute as similar tests at equal visual angles taken at near. The opposite occurs in foveal vision[33] (table 2). Jaensch[34] (1924) found that the Aubert-Foerster phenomenon was more marked the more complex the acuity test target, and not present when the rest of the visual field was filled with attention attracting objects.

The Aubert-Foerster phenomenon may be explained by the horopter projection-size theory on the basis that attention to peripheral targets may increase fixation disparity or foveal fusional slip. In near vision, such fusional slip would be exophoric. A near target would therefore be projected and magnified on a more distant horopter (fig. 8-d). It is just possible that with constant retinal image size, a larger perception image might increase visual acuity. This is particularly true in the peripheral retina where visual acuity is not proportional to the cone population density.

Increased foveal acuity for distance compared to near is explained on an optical basis by Hartridge[36] (1950), such that the foveal image should be 33 percent larger for a distant object subtending the same visual angle from the nodal point as a near object. This correlates well with subjective tests given in Table 2, where the average foveal image for distance is 50 percent larger than that for near, if visual acuity is any indication of image size.

I interpret this as evidence that with foveal fixation, accommodation tone is increased, the horopter approaches too near, the projection image is small, and the foveal visual acuity decreased for near.

Pick[37] (1910) first reported the visual field correlate of the Aubert-Foerster phenomenon, and his work was confirmed by Schwartz[38] (1930) and others. The angular extent of the visual field of normal subjects was found to vary with the fixation distance even when targets of equal visual angle and brightness were used.

Visual perception and recognition of objects was found greater for near than for distance. With constant visual angle of the test object, the extent of the visual field for near was much greater (fig. 8-e).

This work was done monocularly, but it is well recognized that changes in convergence tone persist in temporary monocular occlu-

TABLE 2

Distance foveal acuity is compared to near[35]

By comparison, Snellen types assume an acuity of 60-seconds arc at any distance

Authority	Test	Distance	Seconds of Arc	Percent Distance Is Better
Volkmann	Spider web	19 cm.	153.2	90%
		25 cm.	80.4	
E. H. Weber	Line grating (both near)	25 cm.	93.3	27%
		31 cm.	73.0	
Bergmann	Line grating	5.5 m.	75.0	45%
		8.0 m.	51.6	
Helmholtz	Rod grating	2.4 m.	93.0	46%
		3.5 m.	63.8	
Tob. Mayer	Checkerboard	3.9 m.	124.0	53%
		5.0 m.	81.0	
Freeman, E.[34]	Minimum separable	30.0 cm.	250.0 (est.)	285% (est.)
		3.0 m.	90.0	
Luckiesh & Moss[35]	Minimum separable	60.0 cm.	81.0 (est.)	55%
		280.0 cm.	52.	

sion until, in some final stage, cerebral suppression occurs.

Exophoria occurs during the study of a near visual field because of less stimulation to accommodation of peripheral retinal images. The stimulus to accommodation is a blurred image on the retina. Naturally, a blurred image on the peripheral retina is not as much noticed as a blurred image on the fovea, and, therefore, is a weaker stimulus to accommodation.

An analogous effect was described by Blumenfeld and Mayer-Hillebrand[39] in their famous alley experiments in 1931. Figure 8-e shows that, when tiny flames or fine vertical wires are arranged in two rows to form subjectively parallel or equidistant walls as of an alley, the objective result (solid lines) is narrowed toward the eyes. Subjectively, AB is the same distance as A′B′.

When a subject looks at point A and adjusts B in peripheral vision, accommodative-convergence tone is reduced, the effective horopter moves more distant and distance, AB, appears longer than it truly is. When he looks at point B and adjusts A in vision far from the fovea, the same error occurs. More distant objects A′ and B′ do not have to stimulate accommodation at all, and are imaged on more nearly central retina, so the effective horopter falls through the actual points, and the magnification does not occur. The physical distance of the alley phenomenon is the same as that of the Aubert-Foerster and size-constancy phenomena (fig. 4 and fig. 8-d).

10. Ogle's induced size effect and physiologic aniseikonia in oblique near gaze

K. N. Ogle[40] found in 1938 that when retinal image size was kept equal in oblique near gaze by means of the mirror haploscope, the image of the adducting eye nevertheless was perceived much larger than that of the abducting eye. The arms of this type of stereoscope swing on a fulcrum functionally in the center of rotation of the eyes. Targets can be turned in any horizontal direction without changing the target distance from the eyes.

Figure 9 shows the induced size effect in oblique gaze, such that the circle seen by the adducted left eye appears larger than the square seen by the right (insert B), although the retinal images of the two targets must be equal. The two images (insert A) match perfectly in symmetric convergence.

Notice in Figure 9 how subjective enlargement of the left image is explained by projection of the retinal image through the nodal point onto the horopter. Perception images arise from the horopter, not the retina. In normal oblique vision, the retinal image of the left eye would be smaller because of difference in distance of the two eyes from the target.

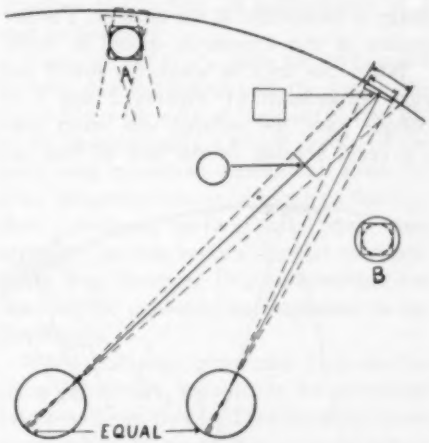

Fig. 9 (Miles). Ogle's induced-size effect. Ogle used a mirror haploscope in which the arms rotated from the centers of rotation of the two eyes. Test patterns of equal diameter were placed at equal distances from each eye in symmetrical and oblique gaze. The illustration shows that in symmetrical convergence, A, the circle seen by the left eye and the square seen by the right correspond in size. In oblique near gaze, the circle seen by the left eye appears about 20 percent larger than the square, provided free eye movements are permitted. Although retinal image size must remain equal, perception plane size is that projected through the nodal points onto the horopter.

Therefore, Ogle's induced size effect appears to be a mechanism compensating for physiologic aniseikonia in oblique gaze. The perceptual image of the adducting eye enlarges to neutralize the decreasing effect of unequal distance on the retinal image size.

Ogle's induced size effect is another example of the disproportionality of retinal image and perception image size. With varying degrees of oblique gaze, one must admit an infinite number of perception image size changes with constant retinal image size in the haploscope experiment. In natural oblique gaze, one must admit an infinite number of retinal image size changes, without loss of binocular function due to perception image aniseikonia.

One may theorize that the adducting eye perception image undergoes magnification as in the Aubert-Foerster phenomenon for near, while the abducting eye perception image is dissociated as for distance. Further studies of this hypothesis should be made.

When one tries to adapt the pencil and ruler experiment of Figures 2 and 3 to oblique gaze, the induced size effect does not occur because of the lack of free eye movements and because the diplopic images are outside of Panum's fusional areas.

Figure 10 shows the equalizing effect in any direction of gaze of perception images as projected on the horopter. Of course, if the object were turned toward one eye or the other, disparity on the horopter would occur, producing inequality of perception images. Therefore, a book should be held as nearly in the plane of the horopter as possible for comfortable reading. With the print broken up into narrow vertical columns, such interference with fusion should be minimal.

11. Exaggeration of aniseikonia on the fusion plane from small retinal image size differences

Ames[8] showed that one percent (the least amount usually responsible for asthenopia)

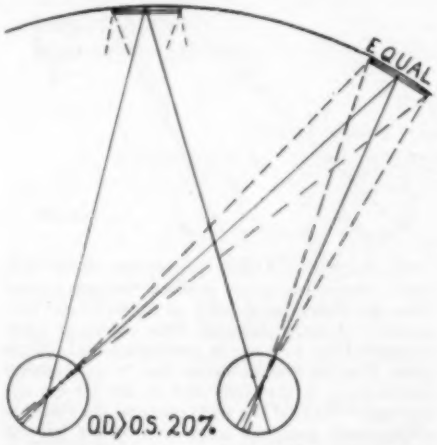

Fig. 10 (Miles). Although in oblique near gaze, the retinal image size may differ as much as 20 percent, the images on the perception plane, like those projected on the horopter, remain equal.

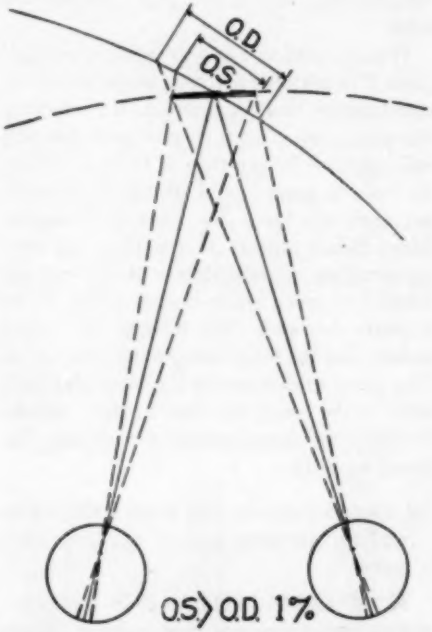

Fig. 11 (Miles). In contrast to Figure 10, in aniseikonia the retinal image size may be very slightly different, but the image size on the perception plane as that projected on the abnormal horopter may differ by 20 percent or more. This disparity increases in oblique near gaze.

of aniseikonia as measured by the instruments can rotate the horopter from three to 40 degrees in the distance range between 20 inches and 20 feet.

Assuming a large object at a distance of 20 feet, Figure 11 shows that one-percent retinal image difference can cause about 25-percent image size difference on the abnormal horopter plane. According to the horopter size theory, this is the amount of aniseikonia presented for fusion on the perception plane, arising from one percent on the retinal image plane.

It is strange that, to correct the horopter rotation, magnification of the retinal image of the right eye (fig. 11) is required while it is the right perception image on the abnormal horopter which already appears too large. I have noticed in clinical practice that patients occasionally insist that the image of one eye needs magnification when the instruments show it required by the other.

12. The effect of alcohol or fatigue on space perception

It is well known that drunkenness or fatigue causes esophoria, perhaps esotropia (Powell, 1938; Colson, 1940; Adler, 1945). It is also well known[14] that persons in these states have subjective shrinking of visual objects. The drunken or tired automobile driver tends to hog the center of the road because the road seems to him unnaturally narrow. Spaces between cars in traffic seem unnaturally small.

This, of course, is the image-reducing effect of esophoria by projection on the nearby and distorted horopter.

13. The wallpaper phenomenon

The wallpaper phenomenon has been a choice subject for discussion since first described by Smith[41] in 1738. I have 23 references to it in my file. It requires a target which nearly fills the binocular visual field, and which consists of repeating patterns which can be easily fused with the eyes crossed. White borders between black bathroom tiles are ideal. While the left fovea fixes a part of one square, the right fovea is fixing the analogous part of another square one or more units removed.

The phenomenon is best elicited by fixing the finger tip and moving it forward and back until fusion of the background pattern two or three feet away occurs. Then the finger is removed, and the eyes can move freely about the target maintaining convergence. The result is startling. The entire pattern becomes smaller and nearer the eyes.

An experimental pattern can be conveniently made by sticking identical postage stamps at equal intervals on a homogeneous surface. When the eyes cross and fuse, the stamp pattern tends to get more distant as well as smaller because of the size constancy of known objects.

Ames[20] used the wallpaper phenomenon to illustrate the failure of convergence as a clue to distance:

Converge and fuse a plane tile surface and observe that it appears half the actual distance. Move the eyes on the pattern laterally to an identical surface which curves on the body axis remaining equidistant from the eyes. When the eyes are crossed on this vertical cylindrical surface, with equal convergence, the tile surface appears to recede to its true distance. This phenomenon has been neither published nor explained to my knowledge.

When the eyes cross and fuse on the plane tile surface, the lines in the peripheral field tend to go double. This doubling is not so noticeable on the cylindric tile surface. I believe that the decrease in disparity of the perception images improves fusion and stereopsis so much on the cylindric surface that distance judgment is more accurate. Stereopsis is, therefore, to be considered a stronger clue for distance than the Koster phenomenon due to strong convergence and a near horopter.

I have constructed schematic diagrams to show about six-percent aniseikonia in

projection images of such plane tile surfaces on the horopter brought near by convergence. Similar diagrams from a cylindric tile surface show no aniseikonia on the horopter plane because both are approximately concentric.

Such experiments cause some eyestrain, and may explain the discomfort one has on observing certain zig-zag textile patterns or pillow ticking. One's eyes cross on such targets and give ambiguous clues for depth which are uncomfortable.

14. The pinhole effect on size perception

Maier[42] (1929) observed while looking through a pinhole that objects appear smaller and more distinct. His description sounds like the Koster effect, although he did not mention it. The micropsia observed was as high as 35 percent, depending partly on the size of the pinhole.

Image size in a camera does not change with a small aperture. Pinhole micropsia must be due either to displacement of the aperture from the nodal point of the eye, or to a true Koster phenomenon and displacement of the horopter.

I found that the micropsic effect of a one mm. pinhole placed as near as possible to the cornea to get a wide field of view in the space-eikonometer caused a size error requiring one-percent magnification. Whether the pinhole was placed before the right or the left eye, that same eye required magnification to correct the target. No error is induced in the space-eikonometer test by introducing smoked glass before one eye, so the error is not due to light intensity differences. The one percent measured aniseikonia is sufficiently different from the 35 percent observed by Maier, that the phenomenon must be that of Koster.

VII. Discussion

The concept of a mobile and flexible horopter that flies out ahead in divergence on departing objects, and retracts toward fixation on approaching objects is a useful one. It provides a mechanical basis for size constancy and all the other peculiar phenomena of binocular and monocular vision described here.

Retinal slip, or better, fixation disparity[2] by which is meant the slight but maintained displacement of the foveal visual lines from the object fixed, is the cause for such displacement of the horopter. The relation of fixation disparity to heterophoria is unquestioned, so the importance of the horopter in patients with heterophoria is obvious.

Even in the normal individual, vision is a more haphazard and variable function than is commonly taught. Peckham[43] (1934) determined the position of the eyes while making tests of heterophoria with the Maddox rod. He concluded that such tests do not measure the deviations of foveal visual lines in the fusion-free position. He found that the eyes commonly come to a fixed position four or five degrees off the foveal visual lines in normal subjects who thought they were fixing the line and light centrally.

In tests of fusional amplitudes with about 10 prism diopters divided between the eyes, base-in or base-out, while the subject believed the test object was still fixed centrally, he found that the image of the test object in either eye was three to four mm. from the fovea.

To teach the cardinal points of the human eye in figures to the fourth decimal place gives a false idea of its precision in action. Functional precision is high, particularly in stereoscopic and vernier acuity. However, exact fixation and focus is not needed to obtain this acuity. Langlands (1927) showed that a light flash 1/500,000 seconds in duration in a dark unfamiliar room was sufficient for fairly accurate stereopsis. Eye movements and accommodation could hardly have been initiated in such time. Some kind of a working horopter must be present.

Gertz[44] (1935) and others have shown that eyes do not remain stationary during careful fixation even before the deviations

due to fatigue begin. He furthermore noticed a marked convergence movement of the eyes at the moment they moved from the end of a line of print to the beginning of the next. This, I think, may merely indicate the dominant right eye preceding the left as usual in ocular movements. However, the effect of such movements on the mobile horopter must be considerable.

The theory that images on the perception plane where fusion takes place are related in size and shape to retinal images projected through the nodal point onto the horopter is not contradicted by anatomy. Troland[45] (1924) discussed this in his *Optics of the Nervous System.*

The cerebral layers devoted to vision contain 10,000 times as many nerve cells for perception as the retina has for reception. It is possible that a cerebral horopter exists with space for movement to include all of the field of view. Such a concept is necessary for one to understand the Ames's[26] finding of an infinite number of different retinal images capable of producing the same sensation.

Hering's rule that a definite pair of retinal points corresponds to each point in objective space should be modified to say that a point in the cerebral visual cortex after fusion corresponds to a point in objective space.

Bielschowsky's idea that eye muscles have their excursion extent decided for them before the movement begins is better correlated for various fixation distances by this modification. Innervation for ocular movements should originate not at the retinal level, but at the cortical perception level.

Whether psychologic factors, as attention, experience, contrast, rivalry, and so forth, affect size perception will not be discussed here. In the past, the fact of size constancy has been called psychologic and related to color constancy. A blue dress looks blue in sunlight, but is just as blue in yellow artificial light when physically the color may be green.

The psychologic clues to size perception should now take a subordinate place in favor of horopter projection size.

It has been shown that eye movements and heterophoria will displace the horopter. It is worth consideration that the desire for symmetry and true perception might result in the horopter initiating eye movements and heterophoria. If the horopter is abnormal, compensatory action follows. This may be in the form of suppression, heterophoria or even heterotropia. Those persons incapable of such compensation may suffer asthenopia which does not respond to present treatment.

VIII. Conclusions

The horopter projection-size theory may be stated as follows: The size and shape of visual images on the plane in the cerebral cortex where perception and fusion take place are not proportional to the size and shape of images on the two retinas, but are proportional to such images after being projected from the retinas through the nodal points of the eyes onto the horopter.

Such projected images are not necessarily localized in space at the distance of the horopter.

The new theory explains such a multitude of experimental facts, previously considered purely psychologic, that it merits further study and application. It provides a simple mechanical link between visual perception and objective space, where previously no possible direct relation could be seen.

It is based on a new mobile concept of the horopter. The horopter is not a theory, but a basic phenomenon of binocular vision upon which all stereoscopic depth judgments, size judgments, eye movements, and fusion depend. It is a flexible reference surface which varies with fixation distance, state of convergence innervation, heterophoria, aniseikonia or corrected anisometropia, obliquity of gaze, type of ametropia, and prisms or the prismatic equivalent of spectacle lenses being worn.

Upon observation of a departing object, the horopter flies out ahead of fixation, caus-

ing the perceived size as projected to increase, resulting in size constancy. Upon observation of an approaching object, the horopter again precedes the fixation point, making the projected image size decrease as the visual angle increases, maintaining size constancy.

Fusion of images as projected on the horopter is facilitated since the physiologic retinal aniseikonia in any degree of oblique near gaze is automatically neutralized. On the other hand, it is easily shown that one percent of retinal aniseikonia will produce such rotation of the horopter that in any position of gaze there may be as much as 25 percent aniseikonia of the images on the perception and fusion level.

Abnormal rotation of the horopter about the point of visual fixation is the measurable anomaly in aniseikonia and the one which may be assumed to cause asthenopia. It is just as reasonable to assume that other displacements and distortions of the horopter due to heterophoria or to corrected ametropia likewise cause asthenopia or impairment of visual function.

Perhaps lenses and prisms should be designed with corrected curves which in ametropia and heterophoria would correct the horopter shape and position as well as its rotation.

It is significant that most of the phenomena described here are most noticeable at near, between 20 cm. and six meters. This is the range in which convergence innervation is useful to maintain fusion. It is the range in which the size constancy effect occurs. The movements of the horopter described here are so intimately correlated with innervation to convergence, that a highly organized reflex mechanism must exist.

For future study remains the possibility that to obtain a symmetrical horopter, innervations may be set up which become the original cause of heterophoria.

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OCULAR PEMPHIGUS

Report of a classical case

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Review

Definition. Ocular pemphigus is a term which denotes a benign but serious affliction of the palpebral and bulbar conjunctivas and later the corneas of the eyes, with or without the general dermatologic involvement. It consists essentially of a shrinkage of the mucous membrane, diminution of tears, and the sequelae resulting from the foregoing, such as ulceration of the corneas, symblepharon, iritis, and so forth (fig. 1).

Classification. Most authorities agree on the following classification: Pemphigus vulgaris acutus (Brocq's pemphigus subaigu malin), pemphigus vegetans, pemphigus vulgaris chronicus, pemphigus erythematosus, and pemphigus of the mucosas.

Fig. 1 (Corboy). Beginning symblepharon, marginal corneal ulceration, and trichiasis.

This classification has been adopted by recent authors.[1] For a classical description and histologic treatise on ocular pemphigus, the paper of Lever and Talbot[6] is of extreme value.

Incidence. The incidence of ocular pemphigus among cases of pemphigus in general is low and may not even be associated with the latter. Gellis and Glass,[2] in reviewing 170 cases, found the highest incidence (49 percent) among Jewish people; the trunk was involved in the highest percentage of cases (38 percent); the next highest, the mouth; and, lastly, the conjunctivas.

Various estimates of ocular involvement vary from one in 9,000 cases as reported by Franke[3] to as low as one in 75,000, as reported by Posey.[4] Lever,[5] however, reported that ocular manifestations occurred in 25 percent of his case studies.

Pathologic picture. A general description of the pathologic picture is difficult because of the many variations. The predominant early pathologic change is one of a deterioration of the normal mucous membrane into a dry, cicatricial skin mass.

This change is progressive and often times so rapid that it is difficult to conceive of such a process making such headway. The average case will show stages of remission, sometimes months apart. The ophthalmologist, however, must bear in mind that at any time he may expect a fulminating progression of this destructive process.

Laboratory findings. The phytopharmacologic test of Macht and Pels is a definite diagnostic aid. In this test, the rate of growth of a laboratory plant, such as lupinus albus seedlings, is checked after the plant has been exposed to centrifuged blood serum or spinal fluid of a suspected patient.

The more recent Macht-Ostro test is of considerable assistance in confirming a diagnosis of pemphigus. This test consists in detoxifying the serum of a pemphigus patient by a brief exposure to specially filtered X rays. The spinal fluid in a suspected case is also briefly exposed to X rays. The presence of both a positive Macht-Pels and Macht-Ostro test is of high significance in confirming the diagnosis. Recently, David I. Macht[8] has been working in vitro on the effect of minute doses of cortisone on the toxicity of blood serum in a case of pemphigus. He has found that minute quantities produce a detoxification of the serum as tested by his other methods. In the case here reported the result was positive by this method both on the blood serum and on the spinal fluid.

Symptomatology. Early objective symptoms include thickening of the lid margins, beginning dryness of the conjunctival mucous membranes, and a slight tendency toward ectropion. Suppuration of the conjunctivas, due to mixed organisms, is frequently present and is often followed by a red, viscous, mucous discharge which is of considerable annoyance to the patient, requiring frequent removal during the day.

Vision is not involved early but is lost quickly during the subsequent corneal involvement.

Early in the disease the patients are not too uncomfortable. The subjective symptoms include a feeling of dryness, intense itching, and photophobia. As the condition progresses the rapid change in the symptoms from day to day is spectacular.

The mucous membrane cells of the conjunctivas are replaced by dry skin (stratified squamous epithelium); corneal involvement progresses rapidly; marginal and later central ulceration may develop together with pannus and extreme pain. Later complications are symblepharon and ankyloblepharon.

Differential diagnosis. In the differential diagnosis of pemphigus, all disease processes which will ultimately show the classical picture of conjunctival shrinkage, symblepharon, and ankyloblepharon must be excluded, as well as those processes which produce "essential shrinkage" of the conjunctiva (the cause of which is unknown), trachoma, and

destructive conjunctivitis—such as those caused by diphtheria and gonorrhea.

Treatment. A review of the literature reveals that the most successful treatment to date is the prescribing of arsenic together with multiple vitamins, especially vitamins A and D.

Adrenocortical extract and dihydrotachysterol gave fair to good results in the hands of Lever and Talbot.[6] Ormsby and Montgomery[7] suggest the use of quinine, sodium arsenate, stovarsol, iron cacodylate, and moccasin venom. The use of the newer antibiotics—aureomycin, streptomycin, penicillin, and chloromycetin—should be included in the treatment, and the value of the sulfonamides must not be overlooked.

In the case to be presented, I used, in addition to a majority of the foregoing drugs, hydrosulphosol both internally and locally, with a fair degree of success. The use of this drug may have been responsible for the six months' remission in the progress of this case.

The surgical treatment of pemphigus consists of treating the sequelae that arise. Early trichiasis must be energetically treated by epilation or galvanic therapy. Symblepharon may require surgical intervention. Marginal corneal ulceration is benefited by daily instillation (four to five times) of artificial tears (methyl cellulose). Contact lenses, filled with normal saline and worn for periods of two to three hours, give the corneas considerable relief during an exacerbation of the ulcerative process. Ultimately all treatments seem to be of no avail.

Case report

History. S. G., a Filipino, aged 44 years, by occupation a typesetter in a printing plant, was first seen in April, 1948. At that time he had been under the care of a dermatologist for a severe pemphigoid type of skin eruption. His chief complaint was a mild burning, itching, and dryness of his eyes.

Examination revealed a beginning shrinkage of the conjunctivas of the lid margins, very slight pannus, an absence of corneal ulceration and scarring. His corrected vision was 20/30, O.U.

The laboratory findings were essentially normal,

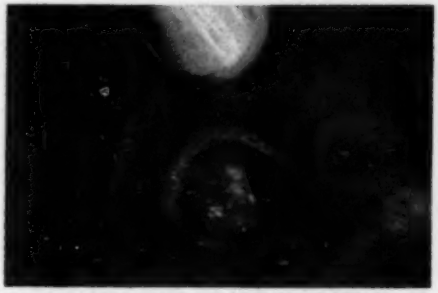

Fig. 2 (Corboy). Advancing symblepharon, ectropion, and corneal involvement.

the blood examination showing 4,800,000 red cells, 95 percent hemoglobin, and 5,800 leukocytes, with a normal differential count. The Kahn and Wassermann reactions were negative. The skin Mantoux test was negative.

The management at that time consisted of epilation and treatment of a mild trichiasis which was present. A low-grade suppurative conjunctivitis was brought under control by the use of sodium sulfacetamide (30-percent solution). The patient was instructed to use artificial tears four to five times daily.

He was kept under more or less continual office observation for one year, during which time there was a slow, progressive shrinkage of the mucous membrane of both lower lids, with beginning bilateral ectropion (fig. 2).

He was given large doses of arsenic under the care of a competent internist, and multiple vitamins with large doses of A and D three times daily. The results were apparently beneficial. Atropine was necessary occasionally to control the mild ciliary irritation of the marginal corneal ulceration which resulted from the trichiasis and conjunctival shrinkage.

Corrected vision at the end of one year was reduced to 20/50, O.U. The patient was able to continue his occupation as a typesetter with occasional loss of time due to mild flare-ups of low-grade iritis and keratitis.

Early in 1950, the patient had a rather severe episode of corneal involvement and it became necessary to use atropine continuously. This interfered considerably with his work and he resigned from his position.

Hydrosulphosol therapy was begun and continued for three months, producing an apparent retardation of his symptoms.

The blood serum and spinal fluid were subjected to the Macht-Pels index test which showed definitely positive results. After exposure of the serum in vitro to filtered gamma rays, the Macht-Ostro test gave a positive reaction for pemphigus. These two tests confirmed the clinical diagnosis of pemphigus and made it possible to warn the patient that he would suffer loss of vision.

Fig. 3 (Corboy). Oral involvement with replacement of the mucous membrane of the lip with dense, dry epithelium.

At this time (early 1950) it was noted that, associated with the conjunctival shrinkage and ocular findings, there were beginning mucous membrane changes about the oral cavity. The mucous membrane of the lips was being replaced by dry skin, the patient finding it difficult to keep his lips moist (fig. 3).

In April, 1950, his best corrected vision was 20/70, O.U.

During the summer months, the degenerative process spread rapidly. Complete corneal involvement, with pannus and scarring took place within a period of 12 weeks and resulted in a diminution of vision to hand movements in both eyes.

The subjective symptoms of dryness and corneal irritation and pain continue to plague this unfortunate individual. There is evidence of increasing toxemia and it is felt that symptoms of generalized pemphigus will soon become manifest. Surgically, it may be necessary to perform a complete cicatrization of both upper and lower lids in order to relieve the pain.

Summary

The case of ocular pemphigus reported shows the unsatisfactory status of present therapeutic methods.

It emphasizes the importance of early diagnosis by careful consideration of early mucous membrane changes and differentiation from other conditions likely to cause such changes.

Earlier use of the Macht-Pels and Macht-Ostro tests might have made it possible to establish the diagnosis at a time when the ocular findings were minimal.

These important tests help the ophthalmologist to foresee and thus forewarn the patient of complete visual loss.

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CORRELATION OF SURGICAL TREATMENT OF ESSENTIAL HYPERTENSION WITH BLOOD-PRESSURE RESPONSE TESTS AND RETINAL CHANGES*

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At present there are no certain clinical or ophthalmoscopic criteria for the selection of patients for surgical treatment of essential hypertension. It is well understood, however, that it is in those patients in whom the vasospasm is due wholly or in large part to neurogenic influences that a lowering of blood pressure may be expected to follow surgical intervention on the autonomic nervous system.

In an effort to devise reliable tests for the identification of such cases, it has been demonstrated that the degree of reactibility of the systemic blood pressure to various stimuli is an index of vasomotor tonus.[1] As a result, and although there is considerable doubt as to their accuracy, blood-pressure response tests now furnish one of the basis for the selection of cases suitable for sympathectomy.

Retinal changes, in varying severity, furnish another basis, and the present study was undertaken in an attempt to determine whether or not there exists any statistically significant correlation between the retinal lesions, the blood-pressure response tests, and the results of operation.

To this end, during the years 1942 to 1949, ophthalmoscopic examinations were carried out on 244 patients with essential hypertension. These patients were admitted to the University of California Hospital neurosurgical service under Dr. Howard C. Naffziger for clinical and laboratory investigation of their suitability for surgical treatment.

The fundus examination was directed toward determining: (1) The extent of the vascular damage to the retinal arterioles, and (2) the significance of the associated retinal lesions. For these purposes the patients were grouped according to the classification of hypertensive cases suggested by Keith, Wagener, and Barker:[2]

Group I. Benign cases with minimal retinal changes consisting of mild narrowing or mild sclerosis of the retinal arterioles.

Group II. Cases with continuously elevated blood pressure and more distinct changes in the retinal arterioles. Retinitis is usually absent although the picture is sometimes complicated by the presence of a thrombosis of a retinal vein or the occurrence of a retinopathy of the arteriosclerotic type. The cerebral, cardiac, and renal functions remain good in these two groups whether the hypertension is labile or high, with a tendency to fixation.[3]

Group III. Cases with retinopathy of the angiospastic type, characterized by retinal edema, cotton-wool patches and hemorrhages, together with sclerotic changes and spastic lesions in the arterioles. In these cases, there is no edema of the optic disc. Early in the disease the cardiac and renal functions may be adequate but they soon show impairment.

Group IV. Cases displaying the so-called "malignant hypertension syndrome." In addition to the angiospastic type of retinopathy seen in Group III, there is the important feature of measurable edema of the optic disc. All cases sooner or later show definite impairment of the function of the brain, heart, and kidney.

In determining the extent of the retinal arteriolar damage, consideration was given to the degree of generalized narrowing, of localized narrowing, and of sclerosis. The severity of these changes was graded on the

* From the Division of Ophthalmology, University of California School of Medicine. Candidate's thesis for Membership in the American Ophthalmological Society, accepted by the Committee on Theses.

basis of 1 to 3. Unless visible changes could be seen in the vessel walls, generalized narrowing of the arterioles was regarded as an expression of increased arteriolar tonus.

It was not possible in all instances to state with certainty that the localized narrowings were due to an isolated active angiospastic process. They were assumed to express an active phase only if the central arteriolar light reflex narrowed or disappeared at the point of constriction, if the narrowing occurred evenly from both sides of the vessel in a smooth hourglass manner, and if the margins of the vessels in the region were not clearly visible.

Indistinct margins were considered to be evidence of edema in the adjacent retinal tissue. On the other hand, a localized narrowing was considered to be inactive when the central light reflex became irregularly broadened at the point of constriction, when the narrowing was unequal on the two sides of the arteriole, and when the vessel margins were easily delineated. When cotton-wool patches were present simultaneously, they were considered to be suggestive evidence of activity, but even in these cases most of the scattered isolated narrowings appeared to be fixed and therefore inactive. This feature of the retinal picture will be referred to in this paper as postspastic sclerosis.

Arteriovenous compression and changes in the color of the arterioles were considered by Wagener, Cusick, and Craig[4] to be evidence of chronic sclerosis. This type of sclerosis is to be distinguished from the postspastic variety by its more general and diffuse distribution. It is thought to result from a persistent increased vascular tonus. While the degree of color alteration and arteriovenous compression phenomena formed the principal basis for the grading of the chronic sclerosis, the less important accepted signs of retinal arteriosclerosis were also taken into consideration.

The ophthalmoscopic findings used in this study in the attempt to correlate the blood-pressure response tests with the retinal picture were limited to (1) the retinal changes serving to differentiate the four types of hypertension according to the Keith, Wagener, and Barker classification, (2) the degree of generalized narrowing of the arterioles, (3) the degree of localized postspastic sclerosis and (4) the degree of chronic sclerosis.

The findings of edema of the disc, edema exudates, cotton-wool patches, hemorrhages, arteriosclerotic retinopathy, thrombosis of a vein, or occlusion of an artery were taken into consideration only in so far as they facilitated the proper grouping of the patients according to the type of their hypertension.

Relation of hypertensive groups and retinal arteriolar changes to the blood-pressure response tests (244 patients)

To determine the degree of blood-pressure response to the various tests it was first necessary to establish what constituted a basal level of pressure. In view of the difficulty of arriving at an accurate basal level it seemed best to compute an average of several blood-pressure readings taken after the patient had been quiet and resting in the hospital for two or three days. The degree of response to the tests was calculated from the rise or fall of the diastolic pressure from this basal level.

Amytal test (224 patients)

This test was carried out in much the same manner as outlined by Smithwick.[5] After a light evening meal, three doses of three gr. each of sodium amytal were given by mouth at 6:00, 7:00, and 8:00 p.m. Hourly readings of the blood pressure were recorded from 7:00 p.m. to 7:00 a.m.

The response, which was measured in terms of the lowest readings of the diastolic pressure, was considered satisfactory if the diastolic pressure dropped to 90 mm. Hg or less for patients with a resting diastolic basal level of 120 mm. Hg or less; or to 100 mm.

Hg or less for those with a resting basal level of from 120 to 129 mm. Hg; or to 110 mm. Hg or less for those with a resting basal level of 130 mm. Hg or more.

It can be seen in Table 1 that the percentage of satisfactory response to the sedative test was 100 in 11 patients in hypertension Group I, that the percentage fell off in hypertension Groups II and III, and was only 21 in hypertension Group IV. Also the percentage of satisfactory response is seen to be higher when the retinal arteriolar changes were minimal (tables 2, 3, and 4). Patients with marked generalized narrowing, or with marked postspastic sclerosis of the retinal arterioles, showed the least satisfactory response in this test.

It is also seen from Table 1 that the percentage drop in the diastolic blood pressure was greatest in hypertension Group I (33 percent) and lowest in hypertension Group IV (15 percent). Patients who had minimal retinal arteriolar changes showed a greater percentage drop in diastolic blood pressure than did those with more marked changes (tables 2, 3, and 4).

COLD PRESSOR TEST (173 patients)

A test for measuring vasomotor reaction, consisting in the immersing of an extremity in ice water, was proposed by Hines and Brown in 1932.[6] After the cuff of the sphygmomanometer was placed on one arm of the subject, the opposite hand was placed in ice water (4°C.) to a point just above the wrist.

Readings of the blood pressure were taken at the end of 30 seconds and again at the end of 60 seconds. The maximal reading obtained while the hand was in the ice water was taken as an index of the response. The hand was removed from the ice water and readings were taken every two minutes until the blood pressure returned to or near its previous basal level.

In Table 5 it will be seen that the cold-pressor response, as measured in percentage diastolic blood pressure rise, was greatest in hypertension Group I and least in hypertension Group IV. The degree of response was almost the same whether the generalized narrowing of the retinal arterioles was mild

TABLE 1

RELATION OF HYPERTENSION GROUPS TO AMYTAL TEST

Group	224 Patients	Satisfactory Response	Satisfactory Response (percent)	Average Drop in Diastolic Pressure (percent)
I	11	11	100	33
II	146	81	55	18
III	28	12	43	16
IV	39	8	21	15

TABLE 2

RELATION OF GENERALIZED NARROWING OF RETINAL ARTERIOLES TO AMYTAL TEST

Grade	224 Patients	Satisfactory Response	Satisfactory Response (percent)	Average Drop in Diastolic Pressure (percent)
0–1	98	57	58	20
2	96	49	51	17
3	30	6	20	15

TABLE 3

RELATION OF POSTSPASTIC SCLEROSIS OF RETINAL ARTERIOLES TO AMYTAL TEST

Grade	224 Patients	Satisfactory Response	Satisfactory Response (percent)	Average Drop in Diastolic Pressure (percent)
0–1	79	52	66	21
2	86	44	51	18
3	59	16	27	15

TABLE 4

RELATION OF CHRONIC SCLEROSIS OF RETINAL ARTERIOLES TO AMYTAL TEST

Grade	224 Patients	Satisfactory Response	Satisfactory Response (percent)	Average Drop in Diastolic Pressure (percent)
0–1	70	44	63	21
2	92	42	46	17
3	62	27	43	17

TABLE 5

RELATION OF HYPERTENSIVE GROUPS TO COLD PRESSOR TEST

Group	173 Patients	Average Rise in Diastolic Pressure (percent)
I	11	26
II	111	20
III	23	20
IV	28	17

TABLE 6

RELATION OF GENERALIZED NARROWING OF RETINAL ARTERIOLES TO COLD PRESSOR TEST

Grade	173 Patients	Average Rise in Diastolic Pressure (percent)
0–1	75	21
2	74	20
3	24	20

TABLE 7

RELATION OF POSTSPASTIC SCLEROSIS OF RETINAL ARTERIOLES TO COLD PRESSOR TEST

Grade	173 Patients	Average Rise in Diastolic Pressure (percent)
0–1	61	22
2	68	21
3	44	16

TABLE 8

RELATION OF CHRONIC SCLEROSIS OF RETINAL ARTERIOLES TO COLD PRESSOR TEST

Grade	173 Patients	Average Rise in Diastolic Pressure (percent)
0–1	55	22
2	70	19
3	48	21

TABLE 9

RELATION OF HYPERTENSIVE GROUPS TO EXERCISE TEST

Group	178 Patients	Average Rise in Diastolic Pressure (percent)
I	10	12
II	120	14
III	21	16
IV	27	12

or marked (table 6). This was also generally true in relation to the degree of chronic sclerosis (table 8). There was, however, a somewhat significant correlation between the cold pressor response and the grade of postspastic sclerosis (table 7).

EXERCISE TEST (178 patients)

After the patient had exercised to an extent equivalent to running up three flights of stairs, a blood-pressure reading was made immediately and every minute thereafter until it again approached the previously determined basal level.

As can be seen in Table 9 there was no consistent correlation between the hypertensive groups and the percentage rise in the diastolic blood pressure in this test. This also applied to generalized narrowing of the reti-

TABLE 10

RELATION OF GENERALIZED NARROWING OF RETINAL ARTERIOLES TO EXERCISE TEST

Grade	178 Patients	Average Rise in Diastolic Pressure (percent)
0–1	78	14
2	78	12
3	22	18

TABLE 11

RELATION OF POSTSPASTIC SCLEROSIS OF RETINAL ARTERIOLES TO EXERCISE TEST

Grade	178 Patients	Average Rise in Diastolic Pressure (percent)
0–1	64	16
2	64	13
3	50	12

TABLE 12

RELATION OF CHRONIC SCLEROSIS OF RETINAL ARTERIOLES TO EXERCISE TEST

Grade	178 Patients	Average Rise in Diastolic Pressure (percent)
0–1	58	16
2	74	13
3	46	11

nal arterioles (table 10). However, Tables 11 and 12 show that the blood-pressure response was minimal when the grade of postspastic or chronic sclerosis was marked.

The hyperventilation and carotid sinus tests were carried out on only 48 patients and the breathholding test on only 40. These numbers were considered to be too small for correlation purposes, and therefore no opinion regarding these tests will be given here.

Relation of Hypertensive Groups and Retinal Arteriolar Changes to Results of Operation
(140 patients)

A bilateral two-stage thoracolumbar sympathectomy operation[7] was performed on 140 of the 244 patients examined. Of these, 91 were females with an average age of 37.7 years, and 49 were males with an average age of 39.1 years. A considerable number of these patients were not followed beyond the immediate postoperative period, while others were followed as long as 70 months. The average length of postoperative observation was 11 months.

The percentage drop in diastolic blood pressure following surgery was almost identical in all four hypertensive groups (table 13).

It was also essentially the same in all grades of generalized narrowing, postspastic sclerosis, and chronic sclerosis (tables 14, 15, and 16). However, the percentage of patients in whom the postoperative diastolic pressure fell below 100 mm. Hg was high in hypertension Group I (100 percent) and low in hypertension Group IV (26 percent; table 13).

Patients showing mild retinal arteriolar changes were more likely to show postoperative diastolic pressures below 100 mm. Hg than those with marked vascular changes (tables 14, 15, and 16).

These two seemingly inconsistent findings are explained by the fact that patients in hypertension groups with the higher grades of retinal arteriolar damage had an initially higher diastolic pressure. While in these patients the percentage drop in diastolic pressure was equal to the other groups, it still was frequently well above 100 mm. Hg fol-

TABLE 13

Relation of Hypertensive Groups to Results of Operation

Group	140 Patients	Average Drop in Diastolic Pressure (percent)	Diastolic Pressure Below 100 mm. Hg (percent)
I	6	12	100
II	101	13	44
III	14	15	36
IV	19	14	26

TABLE 14

Relation of Generalized Narrowing of Retinal Arterioles to Results of Operation

Grade	140 Patients	Average Drop in Diastolic Pressure (percent)	Diastolic Pressure Below 100 mm. Hg. (percent)
0–1	56	14	57
2	63	12	37
3	21	15	23

TABLE 15

Relation of Postspastic Sclerosis of Retinal Arterioles to Results of Operation

Grade	140 Patients	Average Drop in Diastolic Pressure (percent)	Diastolic Pressure Below 100 mm. Hg (percent)
0–1	50	11	52
2	55	13	42
3	35	16	31

TABLE 16

Relation of Chronic Sclerosis of Retinal Arterioles to Results of Operation

Grade	140 Patients	Average Drop in Diastolic Pressure (percent)	Diastolic Pressure Below 100 mm. Hg (percent)
0–1	50	14	46
2	62	15	46
3	28	11	37

lowing surgery. There were individual exceptions to this rule.

Relation of blood-pressure response tests to results of operation

Amytal (127 surgical patients)

The results of the sedative tests were considered to be satisfactory or unsatisfactory, first, according to the method advocated by Smithwick which was mentioned earlier, and second, by considering those as satisfactory who showed greater, and those as unsatisfactory who showed less than the average, percentage drop in diastolic pressure.

It is interesting to note that the two methods of measuring satisfactory results produced almost identical percentages (table 17). About 53 percent of the patients considered to have had a satisfactory response to amytal showed a postoperative diastolic pressure below 100 mm. Hg, as compared to only 37 percent of those with unsatisfactory responses.

TABLE 17

Relation of amytal test to results of operation

Response	127 Patients	Diastolic Pressure Below 100 mm. Hg	
		No. Patients	Percent Patients
Satisfactory*			
Yes	67	36	54
No	60	22	37
Diastolic Pressure			
Above average	68	36	53
Below average	59	22	37

* Rating advocated by Smithwick.

Cold pressor test (100 surgical patients)

The surgical patients tested by this method were divided into two groups: those who showed greater, and those who showed less than average percentage rise in diastolic pressure. Fifty-nine percent of the patients with greater than average response showed a postoperative level of diastolic pressure below 100 mm. Hg, as compared to 38 percent of those with less than average response (table 18).

TABLE 18

Relation of cold pressor test to results of operation

Response	100 Patients	Diastolic Pressure Below 100 mm. Hg	
		No. Patients	Percent Patients
Diastolic Pressure			
Above average	37	22	59
Below average	63	24	38

Exercise test (110 surgical patients)

In this test the percentage postoperative drop in diastolic pressure below 100 mm. Hg was essentially the same, whether the response was above or below the average (table 19).

TABLE 19

Relation of exercise test to results of operation

Response	127 Patients	Diastolic Pressure Below 100 mm. Hg	
		No. Patients	Percent Patients
Diastolic Pressure			
Above average	39	16	41
Below average	71	31	44

Relation of pulse pressure to retinal lesions and to results of operation

Some significance has been attributed to the pulse pressure in relation to the results of operation. It is apparent in Table 20 that the width of the pulse pressure is on the average narrower in hypertension Group I, and wider in the other groups. It is also considerably wider in patients showing high

TABLE 20

Relation of hypertensive groups to width of pulse pressure

Group	244 Patients	Pulse Pressure
I	15	57
II	154	73
III	32	77
IV	43	78

grades of postspastic or chronic sclerosis of the retinal arterioles, but showed only very slight correlation with increases in generalized narrowing (tables 21, 22, and 23).

Smithwick[8] divided his surgical cases into three types with reference to the width of the pulse pressure, as follows:

Type I. Patients showing a pulse pressure of less than one half the resting diastolic pressure.

Type II. Patients showing a pulse pressure equal to one half the diastolic pressure, or up to 19 mm. Hg more than one half.

Type III. Patients showing a pulse pressure greater than one half the diastolic pressure by 20 mm. Hg or more.

Smithwick found the percentage of good results was highest in Type-I women, and lowest in Type-III men. As can be seen in Table 24, Type-I patients showed a somewhat greater percentage postoperative fall in the diastolic pressure below 100 mm. Hg than did Type-III patients.

In breaking these figures down still further it was found that 52 percent of Type-I females showed a postoperative diastolic pressure level below 100 mm. Hg, as compared to 20 percent of Type-III males.

TABLE 21

RELATION OF GENERALIZED NARROWING OF RETINAL ARTERIOLES TO WIDTH OF PULSE PRESSURE

Grade	244 Patients	Pulse Pressure
0–1	105	73
2	102	74
3	37	76

TABLE 22

RELATION OF POSTSPASTIC SCLEROSIS OF RETINAL ARTERIOLES TO WIDTH OF PULSE PRESSURE

Grade	244 Patients	Pulse Pressure
0–1	82	63
2	94	77
3	68	82

TABLE 23

RELATION OF CHRONIC SCLEROSIS OF RETINAL ARTERIOLES TO WIDTH OF PULSE PRESSURE

Grade	244 Patients	Pulse Pressure
0–1	76	62
2	102	75
3	66	85

TABLE 24

RELATION OF PULSE PRESSURE TO RESULTS OF OPERATION

Smithwick Types	140 Patients	Diastolic Pressure Below 100 mm. Hg	
		No. Patients	Percent Patients
I	47	23	49
II	52	21	40
III	41	16	39

COMMENTS

It is apparent from the foregoing tables that patients in the hypertension groups with mild retinal arteriolar changes in general showed a good blood-pressure response to the reactivity tests and a relatively high percentage of good surgical results. This applied particularly to the amytal test. It was found that the postoperative diastolic pressure was below 100 mm. Hg in 72 percent of patients who showed, on the average, about Grade-1 generalized narrowing, postspastic sclerosis, and chronic sclerosis of the retinal arterioles, and who also showed a satisfactory response to amytal.

It was consistent that the reverse should be true of patients showing, on the average, greater than Grade-2 generalized narrowing, postspastic sclerosis or chronic sclerosis, and a poor response to amytal. Only 20 percent of the patients falling in this category had a postoperative diastolic pressure below 100 mm. Hg.

Many of the patients in hypertension Group III and most of those in Group IV were among the 80 percent with a postoperative diastolic pressure above 100 mm. Hg. This would seem to imply that patients with high grades of retinal arteriolar damage, with angiospastic retinopathy, and especially with edema of the disc (Group IV), and whose blood pressure response to amytal was poor, should be refused surgery.

There has been considerable debate on this

point, however. Opinions vary from that of Bedell,[9] who considers most of the ophthalmoscopic findings as a contraindication to surgery, to that of Fralick and Peet,[10] who state that the preoperative examination of the retina gives no indication whatever of the probable results of operation. Wagener, Cusick, and Craig[4] take an intermediate view of the importance of the retinal findings.

It would seem that in the last analysis it is not so much how well a hypertensive patient will do with surgery as whether he will do better with surgery than with medical treatment. With this in mind, Woods and Peet[11] compared 76 surgically treated patients, followed from five to seven years, with a series of 219 medically treated cases which had been followed from five to nine years by Wagener and Keith.[12]

At the time of publishing their report, Woods and Peet had operated only four patients in hypertension Group I and so could draw no conclusions with respect to patients in this group, but it has been suggested by the work of Allen and Adson[13] that patients in hypertension Group I often do not need surgery.

In the series of hypertension Group II patients (Woods and Peet), those treated medically did better than those treated surgically; at the end of five years only 40 percent of the surgical patients were still alive as compared with 54 percent of the Wagener-Keith control series.

An entirely different situation obtained with respect to patients in hypertension Groups III and IV. At the end of five years, 67 percent of the Group III surgically treated cases had survived, as against 20 percent of those treated medically, and 33 percent of those with malignant hypertension (Group IV) survived surgical treatment, as compared with less than two percent of the Group IV medically treated control series.

These results would indicate that patients in Groups I and II should probably be rejected for surgery because they are likely to do as well, or better, on medical treatment. They also indicate that the presence of angiospastic retinopathy, with or without edema of the optic disc, should be considered an indication for surgery rather than a contraindication, and that patients in Groups III and IV should therefore be offered surgery.

It is suggested by the results of the present study, however, that patients in Groups III and IV should perhaps not be selected for surgery when the retinal arteriolar damage is severe and the blood-pressure response to amytal poor. It seems that in any event the surgical prognosis is better if the retinal arteriolar damage is slight and the patient shows a satisfactory response to amytal. It is, of course, assumed with reference to all cases selected for surgery that the internist or neurosurgeon has already found the patient a good surgical risk, able to survive the immediate effects of a two-stage major surgical procedure.

Summary and Conclusions

1. A series of 244 patients with essential hypertension were subjected to ophthalmoscopic examination and to blood-pressure response tests in an effort to correlate the findings with the results of sympathectomy.

2. The ophthalmoscopic findings used in these correlation studies were limited to the following: (1) The retinal changes serving to differentiate the four types of hypertension according to the Keith, Wagener, and Barker classification; (2) the degree of generalized narrowing of the arterioles (grades 1-3); (3) the degree of localized postspastic sclerosis (grades 1-3); and (4) the degree of chronic sclerosis (grades 1-3).

3. In general, patients with mild retinal arteriolar changes showed good blood-pressure response to the reactivity tests and a relatively high percentage of good surgical results.

4. Of the three blood-pressure response tests (amytal test, cold pressor test, and exercise test), the amytal test showed the most significant correlation with the retinal picture and with the results of operation.

5. The postoperative diastolic pressure was below 100 mm. Hg in 72 percent of patients who showed on the average approximately Grade-1 generalized narrowing, postspastic sclerosis, and chronic sclerosis of the retinal arterioles, and who also showed a satisfactory response to amytal.

6. The postoperative diastolic pressure was below 100 mm. Hg in only 20 percent of patients who showed greater than Grade 2 generalized narrowing, postspastic sclerosis, and chronic sclerosis of the retinal arterioles, and who also showed a poor response to amytal.

7. Although the decision to offer or refuse surgery must depend on many other factors, it may be concluded from this study that when blood-pressure response to amytal is satisfactory and the retinal arteriolar damage only slight, the results of surgical intervention are more likely to be good than when arteriolar damage is severe and the response to amytal unsatisfactory.

384 Post Street (8).

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Ophthalmic Miniature

The number of physicians who are working with the ophthalmoscope in England may, I believe, be counted upon the fingers of one hand. . . . Dr. John Ogle was the first physician who called my attention to the probable results of ophthalmoscopic examination in cases of cerebral disease, . . . and he urged that the beautiful vascular structure of the posterior parts of the eye might serve in its variations as an index to the vascular condition of the intracranial organs.

T. C. Allbutt, 1871.

OCULAR MANIFESTATIONS OF SOME TROPICAL DISEASES*

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(Translated by A. G. Wilde, M.D., Jackson, Mississippi.)

Malaria

Malaria is endemic near the shores of Ecuador, especially in the low flat areas. During the rainy season which lasts from December to June, it assumes at times epidemic proportions. Among the ocular manifestations are:

Ocular and periocular pains. The headache, which is a constant symptom of the acute attack involves, both the global and frontal regions. There are cases in which these symptoms dominate the clinical picture. At that time the patient presents a mild ptosis and marked photophobia. The pains are spontaneous, aggravated by pressure, increased by efforts at accommodation and always bilateral.

Trigeminal neuralgia. This is observed with relative frequency. Generally the ophthalmic branch is affected, the pains being intense and quite prolonged. The time of its recurrence is rather fixed, showing the intermittency characteristic of malaria.

The malarial history suggests the diagnosis, but there are cases of latent malaria in which the only manifestation is the neuralgia, making difficult the recognition of the cause. Blood examinations for the parasite may be negative. Only the therapeutic proof gives a hint of the etiology.

Lids. As mentioned, during the acute febrile period there is likely to be a slight ptosis, especially when the ocular pains are intense. During and after this acute phase, plaques of herpes may appear on the lids, but more frequently on the lips.

Extrinsic muscles. I have seen only one case of incomplete paralysis of the external rectus, the course of which was mild. I believe a paralysis of an external muscle is very rare.

Intrinsic muscles. During convalescence from the acute forms, I have frequently seen ciliary asthenopia. When there is a serious deterioration of the general health, this may also occur during the chronic forms. Among those persons approaching 40 years of age, there comes a rapidly advancing presbyopia which calls for the use of lenses of greater strength than would usually correspond to that age.

Conjunctiva. During the febrile recurrences, there is a marked hyperemia of both the bulbar and palpebral conjunctiva. Whenever any degree of anemia has been produced, the palpebral conjunctiva is quite pale. Among farm workers, I have observed with relative frequency an enlargement of the bulbar conjunctiva in the palepbral fissure, along with diffuse pigmentation.

Cornea. During the febrile attacks, but more frequently four or five days after the temperature has returned to normal, I have seen herpes or dendritic ulceration. In its treatment, I have always employed local applications of iodine or ether, along with treatment of the basic malaria. Its course, although at times prolonged and capricious, has appeared to be less difficult than those cases with indeterminate etiology. Considering the high incidence of malaria in Guayaquil, these complications are rare.

Uveal tract. I have never observed cases of iritis, cyclitis, or choroiditis of undoubted malarial origin. There is frequently a malarial background, but I have never found a justification to attribute these ocular conditions to malaria. In negative malarial cases, I have noted a great number of cases of uveitis of varied clinical forms but unknown cause.

* Presented before the III Pan-American Congress of Ophthalmology, Havana, 1948.

NEURORETINITIS. I have observed a few cases of complete blindness but suspect that, in all of them, the origin was not malarial but quinine intoxication. It is probable that many of the cases of malarial blindness are due to quinine.

My records show five such cases occurring in young children. These patients suffered acute malarial attacks with symptoms of the pernicious forms, and were given large doses of quinine either by mouth or parentally. The resulting blindness was sudden, total or almost total, and always bilateral.

The attention of the mother or nurse is attracted by the apparent severe visual disturbance, along with the symptoms of the acute malaria. There is marked mydriasis and immobility of the pupil. The media are clear. The discs are pale, the vessels attenuated, and the retina seems slightly edematous.

After several hours, at times after a day, the visual powers are slowly reëstablished. After eight or 10 days recovery is complete but, in the majority of the cases, this recovery is not to the same point of acuity as before the attack. The retinal vessels show evidences of sclerosis. The visual potential is subnormal, and the visual fields are narrowed concentrically.

HYPEREMIA OF THE PAPILLA. During high stages of the fever, there is hyperemia of the disc, accompanied by marked photophobia.

HEMORRHAGES. In cases of hyperpyrexia or convulsions, we have seen small interstitial hemorrhages of the retina, which absorb quickly during convalescence without leaving any functional disturbances.

CHAGAS FEVER

Trypanosomiasis Americana, or Chagas fever, is also endemic in Guayaquil. It has been present for over 25 year but was unrecognized until 1929 when its identity was shown by Dr. Claudio Arteaga. In 1941, following the clinical and parasitic study of "Febrile edema of the lids" by Dr. Jose Miguel Varas Samaniego and Dr. Julio Alvarez Crespo, this disease entity was more clearly recognized. The number of cases found annually is not large, around 20, and are seen especially during the milder portions of winter. During summer, the disease occurs sporadically.

The transmitting agent, the Triatoma dimidiata, is referred to as the chinchorro (bed-bug), chupasangre (blood sucker). These insects abound on all the equatorial shores, seeking by preference those houses which are dank and damp with general unsanitary surroundings. The walls of cane make an excellent lodging place for the Triatoma.

The body of this insect is covered by a hard shell, black in color. The middle half of the upper wings is yellow, terminating in a black point; the distal half, dark. The lower wings are transparent. The margins of the abdomen have six yellow spots on each side.

Ocular manifestations of this disease include:

LIDS. Almost all my cases showed an edema of the lids. This edema is unilateral, involving both upper and lower lids. At times it is slight; again, so marked as to hide the palpebral fissure that feels hard to the palpating finger which leaves no pitting. Usually painless, if pain does develop, it may be quite acute, especially along the orbital border. The skin is normal or slightly reddened, especially in the white race. There is always some local heat, perhaps with itching.

This edema constitutes the first symptom of the disease, appearing within the first 24 hours, following the bite of the Triatoma. With few exceptions it remains firm and does not suppurate. Not only is it the first symptom to appear but it is the last to fade.

I regard this lid edema as a local reaction following the entrance of the parasite and not as a toxic or distant allergy, or of secondary involvement. My belief is based upon the fact that frequently the exact time of the bite on the lid can be stated. All other symptoms arise subsequently.

Lid edema is the diagnostic point of Chagas fever. Preauricular and submaxil-

lary adenopathy are associated with it. Fever, appearing on the second or third day, completes the characteristic triad.

CONJUNCTIVA. Whenever Chagas fever starts with a lid edema, the conjunctiva is also involved. Usually there is a bulbar chemosis, especially near the external canthus. At times, this chemosis is so severe that it will form a semicircular wheel which partially covers the external limbus. There is no secretion.

At other times there is found an infiltration of the conjunctiva, with the presence of follicles in the lower palpebral portion, marked hyperemia, and seromucous or mucopurulent secretion which causes the lids to adhere. Microscopic examination of this secretion is negative, revealing only nonpathogenic organisms or desquamated cells in a degenerated condition.

I regard this conjunctival edema as a reaction of continuity. The conjunctivitis arises from a penetration of the mucosa by the parasite. It is very possible that the Triatoma wounds the skin of the lids, making an injection into the conjunctiva, which results in the acute manifestations.

At no time in the evolution of this disease have we observed signs of uveal or retinal involvement.

AMOEBIASIS

Although infestation with the Amoeba is a widespread disease, it is usually included in all works on tropical affections. In Guayaquil the incidence of amoeba is high, involving more than 20 percent of the inhabitants. Nevertheless the eye manifestations are quite rare.

Iridocyclitis. I have observed one case of the plastic type of acute iridocyclitis, but which had no outstanding clinical peculiarities. This arose during an attack of acute dysentery, and disappeared under treatment by emetine and carbarsone.

Choroiditis. One case developed an extensive plaque of exudative choroiditis, grayish in color but without other pigmentary changes, which extended quite rapidly. There was no evident tendency to cure until the parasitic origin was determined.

It is usually difficult to discover the cause of choroiditis, and in a high percentage of cases the source remains hidden. In my case, a rigorous investigation of the possible causes was made, with negative results. An examination of the stools was positive. The patient gave a history of dysenteries but, during the time of ocular involvement, the digestive system showed no clinical disorders.

I used the same treatment as for amoeba elsewhere, and saw a definite improvement of the choroiditis as soon as therapy was started. Later, there was complete disappearance of all pathologic activity. Did this mean a localization of the parasite in the eye, was it a coincident toxic manifestation, or merely a secondary infection?

ANKYLOSTOMIASIS

This endemic disease is very extensive in the tropical portions of Ecuador, especially in those localities subject to flood. Its diffusion is augmented by the custom of our field workers to go without shoes. Although Guayaquil was the point of our studies, many patients were included from that general neighborhood. They came during various seasons and showed all stages of the infection from the relatively benign type, both diarrhea and slight anemia, to far-advanced or fatal cachexia. These observations have been verified in all cases.

LIDS. Often the lids are slightly or markedly edematous. This is bilateral, soft, and localized in the upper lid.

CONJUNCTIVA. The degree of paleness coincides with the degree of anemia. The bulbar conjunctiva, especially the inner portion, is thickened and slightly pigmented.

SCLERA. I have frequently found grayish points, especially in the superior portions. Areas with distinct margins, circular and bluish in color, either single or multiple, have also been noted. These points or areas are

not confined to ankylostomiasis, but their frequency in these infections is such that they provide an important diagnostic point.

FUNDUS. The disc is pale with indistinct borders, and there is frequently a thin veil which obscures details. At times we have observed a transparent film covering the disc. The larger vessels which traverse the disc are pale. Almost always there is venous pulsation and, at times, arterial pulsations are observed but without other signs of increased intraocular pressure. This slight edema of the disc, with practically no alteration of its level, extends in all directions but rarely involves the entire retina.

Changes in the vascular walls are seen with relative frequency, especially in the arteries which seem to show varying degrees of sclerosis. Seldom have hemorrhagic points of the typical interstitial type been encountered. This picture is quite characteristic of ankylostomiasis, and it has been encountered as frequently in the mild forms as in those of severe anemia, with or without renal involvement.

The ophthalmoscopic findings in this anemia are similar to those of other severe anemias of whatever origin. However, the almost invariable presence of anemia in a much higher percentage of cases of ankylostomiasis than in cases of other types of parasitic infestation, makes its presence especially important. The fundus alterations cause no functional disturbances and are of favorable prognosis.

OCULAR MYIASIS

Ocular myiasis is quite rare, only eight cases having been recognized in the last 10 years and all appeared to be caused by the Dermatobia cyanoventris or Dermatobia hominis.

This fly is more common in the cattle lands and country homes. It is grayish blue color, the back showing two longitudinal stripes and the abdomen of a brilliant metallic blue. It is found in all tropical lands and, in Ecuador, thrives in both the low costal regions and high altitudes.

As is well known, this fly entrusts its eggs to the bill of a species of mosquito called Yanthinosoma, which puncture the skin and deposit the eggs. The diminutive larva then penetrate below the human skin, producing cutaneous myiasis. The victims are usually children of two or three years, living in rural sections. The larva is always single, and lodged in the lower lid. There occur itching and slight pain, although the lid is scarcely swollen or reddened. This edema is rather firm and slightly sensitive on pressure. Rarely is there a violent inflammatory reaction.

A well-defined spot is found toward the inner angle, where a rounded orifice develops with well-defined limits. Through this orifice, the slim extremity of the larva frequently appears, and through this it carries on its respiration. Where this orifice occurs in the palpebral conjunctiva, there is an intense hyperemia and violent inflammation of that membrane.

In order to extricate the larva, I have injected the cavity with five-percent cocaine, and waited for the protrusion of the posterior extremity through the orifice in the skin. It is then seized with fine, toothless forceps, just enough traction being applied to assure complete delivery. The patient shows immediate improvement, and the lesion scars over promptly. I have never seen an intraocular involvement.

OTHER INSECTS

There are various other insects peculiar to the tropics whose bites can cause ocular disturbances.

Formicidia family. This has the popular name of patille (spike), the name being applied to various species which are capable of producing the following disturbances:

LIDS. The bite brings on slight pain and moderate edematous reaction, the point of the lesion showing as a red papilla.

CONJUCTIVA. When this ant punctures the conjunctiva, a painful edema and severe hyperemia are produced. At times the head or

pincers remain attached to the conjunctiva, acting as a foreign body.

Holcoponera whymperi. Locally known as the quinquina, this insect has a narrow black body, a quadrangular head, and triangular mandibles. This little ant is likely to invade the older wooden houses. Its bite produces acute pain with a reddish papule and marked edema of the lids, the center showing a hemorrhagic point. One of my cases showed an allergic manifestation and an almost dramatic clinical picture. There was generalized urticaria, a sense of suffocation, tachycardia, edematous lids, and hyperemic and chemotic conjunctiva.

Poederos irritans. This insect has only slight resemblance to an ant, measuring a centimeter in length, black in color, with a bluish shell covered with fine scales. It abounds along the coast during the rainy seasons, and is especially attracted by artificial lights.

On coming in contact with the skin, this insect secretes an irritating fluid which produces a dermatitis with small vesicles which later fuse to form blebs. There is an edema and marked tenderness in the vicinity of the lesions. The dermatitis is of characteristic form, occurring in longitudinal stripes. I have seen cases with dermatitis of this type on both lids which showed a severe edematous reaction along with an appreciable conjunctival hyperemia.

Bees. There are many varieties of bees along the Ecuadorean coast, the most common being the Melipona flavipennis, with yellowish wings and black body. This remains in the forest by preference.

Puncture of the lids by this insect is not rare. It is somewhat painful, and results in a light inflammatory edema, accompanied at times by conjunctival chemosis. These usually disappear within 24 hours.

Polistes versicolor. This insect, known locally as a wasp, is of brownish color. The abdomen has a transverse yellow band, and the wings are clear. It lives usually in the roofs of country homes. Its sting is intensely painful and provokes a violent edematous reaction.

Lids. The edema is so severe that the lids are usually closed or leave no more than a small slit. A pale papule with an edematous center is formed at the point of puncture. In the majority of cases the conjunctiva participates in the edematous reaction. It runs its course in 24 to 48 hours.

Conjunctiva. When this insect punctures the conjunctiva, there is a brisk reaction, with infiltration, great hyperemia, and intense chemosis of the bulbar portion. The resulting severe lacrimation and serous secretions cause the lids to adhere. Within three or four days, the symptoms subside.

Cornea. I have seen cases in which the cornea had been punctured directly. The resulting pain was very severe, with great photophobia and lacrimation, along with diminution of the visual powers. There was an intense hyperemia of the conjunctiva, with infiltration and pericorneal injection. The infiltration is mostly in the superficial layers, with a small erosion at the point of puncture. The corneal infiltration is diffuse and uniform. While usually slight, severe cases show involvement of both superficial and deep layers.

The healing is prolonged, lasting several weeks, and results in the formation of leukomas and a decrease in visual acuity.

Apartado 1174.

ETIOLOGY OF ANGULAR CONJUNCTIVITIS*

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Our interest in the etiology of angular conjunctivitis originates with the observation of large diplococci very often coëxisting with Morax-Axenfeld's diplobacilli in smears from these cases by one of us (Y. M.).

Authoritative texts hold that Morax-Axenfeld's diplobacilli are the only etiologic cause of this condition having a universal pathogenicity to the human eye and that an inoculation with them would result in a conjunctivitis after an incubation period of four days (Morax,[1] Axenfeld,[2] Topley[3]).

Thus a clinical research study was instituted, and the results seem to indicate that the unidentified diplococci may play an important part in the etiology of angular conjunctivitis.

PRELIMINARY STUDY

Conjunctival smears from 3,008 patients or 45 percent of all the eye-clinic entries were examined regardless of their eye complaints; 941 or 31 percent of these patients examined showed diplobacilli in the conjunctival smears; 746 out of 941 cases or 79 percent of the positive cases for diplobacillus showed no clinical signs or symptoms of angular conjunctivitis. Only 195 patients (21 percent) had clinically diagnosed angular conjunctivitis.

Large diplococci coëxisted in the majority of cases with positive diplobacilli.

Total patient entry (January, 1946-June 1949)	6,686
Total patient smears examined	3,008
Total cases positive diplobacilli	941
No. cases positive but no clinical signs	746
No. cases positive smears and clinical signs	195

A second series, a sample statistical study, was made.

Total patient entry (12/15/49—1/13/50)	171
Total cases diplobacilli positive	43 (37)†
No. cases positive but no clinical signs	29 (24)
No. cases positive with clinical signs	14 (13)

The incidence of diplobacillus from the above figures would be in the range of 20 to 30 percent. The incidence of cases with positive diplobacillary smear but without clinical signs or symptoms would be in the range of 14 to 24 percent, and this percentage range could possibly be interpreted as the approximate number of diplobacillary carriers in the population.

The incidence of blepharoconjunctivitis among the diplobacillus positive cases would be in the range of 22 to 43 percent. However, patients entering an eye clinic are not a sample cross section of the population, and percentage of clinical manifestation would probably be much lower. The incidence of coëxisting large diplococci would be in the range of 71 to 92 percent of the total diplobacilli positive cases.

DIPLOBACILLUS

INOCULATION WITH PURE CULTURE OF DIPLOBACILLUS

Two strains of diplobacillus were isolated from two patients who showed clinical signs and symptoms of angular conjunctivitis. Conjunctival smears were loaded with diplobacillus. Both of these strains liquefied Löffler's alkaline blood serum but did not liquefy gelatin and did not grow on ordinary agar plate in contrast to Petit's variation.

As inoculum, cultures on serum agar were used after 24 hours' incubation. One to three platinum loopfuls of pure culture were smeared on the conjunctival surface and on the skin of the outer canthus. One to three

* From the Department of Ophthalmology, Medical College, Kumamoto University.

† Numbers in parentheses show incidences of coexisting large diplococci

TABLE 1

INOCULATION WITH MORAX-AXENFELD'S DIPLOBACILLI

No.	Name	Age	Sex	Days after Inoculation	Bacteriologic Finding		Blepharo-conjuncti-vitis
					M-A	M.C.	
1	S.M.	61	F	2	+	?	−
				7	+	?	−
				14	+	?	−
				150	+++	++	++
2	H.F.	32	M	2	+	−	−
				3	++	−	−
				5	++	+	−
				24	+++	++	−
3	M.H.	35	M	2	+	−	−
				4	+	−	−
				7	+	+	−
				14	+	+	−
4	T.K.	33	M	2	−	−	−
				3	−	−	−
				7	−	−	−
				14	−	−	−
5	R.S.	21	F	4	−	−	−
				4	−	−	−
				7	−	−	−
				14	−	−	−
6	Y.J.	8	F	2	−	−	−
				4	−	−	−
				7	−	−	−
				14	−	−	−
7	T.S.	25	F	2	−	−	−
				5	−	−	−
				7	−	−	−
				14	−	−	−
8	K.K.	26	F	2	−	−	−
				4	−	−	−
				8	−	−	−
				13	−	−	−

M-A = Morax-Axenfeld's diplobacillus
M.C = Micrococcus conjunctivae

inoculations were made at one-day intervals.

The eight human volunteers, free of any conjunctival or lid lesions and free of diplobacillus and micrococcus, were inoculated. Five out of eight cases were negative bacteriologically and clinically. Two of the eight cases (Cases 2 and 3) showed diplobacillary growth after inoculation but no clinical signs or symptoms appeared in 14 days and 24 days respectively. Only one case (Case 1) showed clinical and bacteriologic signs of diplobacillary angular blepharoconjunctivitis. However, the onset was five months after the inoculation. Results are summarized in Table 1.

It is interesting that the three "takes" after inoculation showed an unidentified micrococcus along with the diplobacillus in the smear even though pure diplobacillary cultures were used.

Case 1 responded well to zinc therapy.

The result of the inoculated series seems to corroborate the notation of widespread diplobacillary carriers. The question then arose as to when and under what conditions the infection of diplobacilli resulted in the

onset of angular conjunctivitis. The following studies were undertaken to find the answer.

Vitamin B_2

It has been stated (Ishihara[4]) that a deficiency in vitamin B_2 may predispose toward a diplobacillary infection. Vitamin B_2 therapy was tried on eight cases of angular blepharoconjunctivitis; 0.5 mg. was given daily for six to 28 days. This dosage is sufficient to cure "diffuse superficial keratitis" which is believed to be based on vitamin B_2 deficiency and a condition similar to the "punctate epithelial changes" (Thygeson[5]) found frequently in Japan.

Vitamin B_2 therapy was ineffective.

Vitamin B_6

Another series of cases were treated with vitamin B_6 to determine whether this vitamin played any part in the susceptibility to diplobacillary infection; 10 mg. to 30 mg. of vitamin B_6 daily were given subcutaneously in nine cases of angular blepharoconjunctivitis. Although no other treatment was

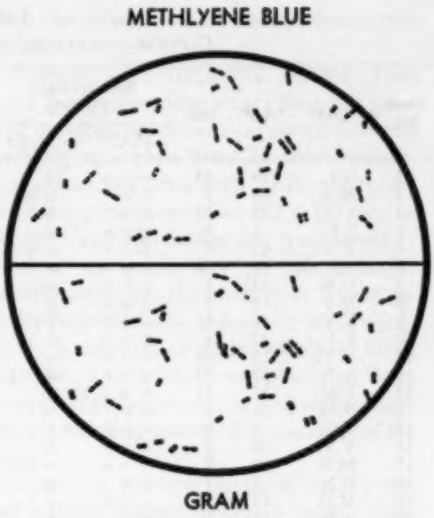

Fig. 1. (Mitsui, Hinokuma, and Tanaka). A typical conjunctival film from a case of blepharoconjunctivitis. Diplobacilli and diplococci (Micrococcus conjunctivae) coëxist.

(Top) Methylene-blue staining. Both microörganisms are hard to differentiate.

(Below) The same slide was decolorized with HCL-alcohol, re-stained with Gram. Both microbes are differentiated distinctly.

TABLE 2

Vitamin-B_6 treatment of blepharoconjunctivitis

No.	Name	Age	Sex	Before Treatment		Total Dose Vit. B_6 (Duration of Treatment)	After Treatment	
				Clinical Symptoms, Blepharo-conjunctivitis	Diplo-bacilli		Clinical Symptoms, Blepharo-conjunctivitis	Diplo-bacilli
1	R.K.	48	M	++	++++	210 mg. (7 days)	–	–
2	N.I.	44	F	++++	+++	150 mg. (5 days)	–	–
3	K.O.	2	M	++	+++	360 mg. (12 days)	–	–
4	Y.N.	17	F	++	+++	270 mg. (9 days)	–	–
5	M.M.	43	F	++	++++	50 mg. (5 days)	++	+++
6	S.U.	3	F	+++	++++	480 mg. (16 days)	–	–
7	K.N.	23	F	++	+++	140 mg. (7 days)	–	–
8	M.M.	25	M	++	++++	250 mg. (5 days)	–	–
9	H.K.	17	F	+++	+++	270 mg. (9 days)	++	+++

TABLE 3

CLINICAL OBSERVATION OF MICROCOCCAL BLEPHARITIS

Case No.	Name	Age	Sex	Bacteriologic Finding		Clinical Forms‡	Effect of		
				M.C.*	M-A†		$ZnSO_4$	Penicil.	Other Drugs
1	S.T.	49	M	+++	+	A	−	+++	
2	M.S.	68	F	++	++	A	++	/	
3	T.Y.	29	M	++	+	A	++	/	
4	S.R.	1	F	+++	+	A	−	/	
5	T.N.	45	F	+++	+++	B	−	++	
6	T.K.	11	M	+++	+	B	−	+++	B_6 (−)
7	U.M.	34	F	+++	+	B	−	++	
8	M.F.	18	F	+++	+	B	/	++	
9	Y.Y.	17	F	+++	+	B	/	+++	
10	E.U.	27	F	+++	++	B	/	+−	
11	Y.Y.	19	M	+++	++	B	−	/	
12	S.T.	39	M	+++	+++	B	++	/	
13	T.M.	45	M	+++	+	B	/	/	
14	A.M.	24	F	++	+	B	/	/	
15	T.G.	1	F	+++	++	B	/	/	
16	Y.Y.	25	F	+++	+	B	/	/	
17	M.S.	51	F	+++	+++	B	−	/	Strepto. (− − −)
18	U.N.	7	F	++	+	C	−	+++	
19	M.O.	12	M	+++	+	C	−	++	B_6 (−)
20	R.M.	11	F	++	+	C	−	+++	
21	F.N.	33	F	+++	+++	C	/	++	
22	T.F.	4	M	+++	+	C	/	+++	
23	Y.N.	3	F	++	+	C	−	/	
24	T.N.	13	M	++	+	C	−	/	
25	T.A.	54	F	++	++	C	−	/	
26	S.S.	60	M	+++	+	C	/	/	
27	I.N.	61	M	+++	++	C	/	/	
28	S.M.	3	M	+++	+	C	/	/	
29	Y.Y.	59	F	+++	+	C	−	/	Strepto. (− − −)
30	F.Y.	28	F	+++	+	C	−	/	Strepto. (− − −)

* M.C.: Micrococcus conjunctivae
† M-A.: Morax-Axenfeld's diplobacillus
‡ A-B- & C-forms are illustrated in Figure 2

given, clinical and bacteriologic cures resulted in seven out of nine cases within five to 16 days. Thus one may infer that vitamin B_6 deficiency may be one of the factors that predispose to a diplobacillary infection.

MICROCOCCUS SP.

The coëxisting micrococci appear in pairs as diplococci and measure 1.5 to 2.0 microns. They are gram positive in contrast to diplobacilli which are gram negative (fig. 1). Diplobacilli tend to be polymorphous showing long and short forms. Therefore, a hasty examination of smears without the use of Gram stain will often miss the differentiation of the two organisms.

CLINICAL STUDY

Clinical observations since noting the coëxistence of diplococci with diplobacilli show that there are cases with a heavier infection of the former than the latter. These cases were more severe and the lid dermatitis had a tendency to spread and involve the whole lid margin. Also $ZnSo_4$ and vitamin B_6 were usually ineffective. Penicillin on the other hand showed a dramatic effect (little effect on diplobacillary conjunctivitis.)

Assuming that there were two different organisms involved, the cases were divided into two series depending on which type of organism was more abundant. A series of 30 cases appearing to have been caused primarily by diplococci were studied (table 3). In all cases diplobacilli coëxisted in varying degrees.

In four out of the 30 cases the clinical symptoms were similar to those of diplobacil-

lary angular conjunctivitis (fig. 2-A). In 13 cases the symptoms were more severe (fig. 2-B). The remaining 13 cases out of 30 cases studied showed a very severe clinical picture (fig. 2-C).

Eighteen cases were treated with $ZnSO_4$ (0.5 and 1.0 percent solutions, six times a day for one to two weeks) but only three cases showed some improvement. Breakdown of these cases treated with $ZnSO_4$ are:

Figure 2-A type (mild) two cases out of four showed improvement.

Figure 2-B type (moderate) one case out of six showed improvement.

Figure 2-C (severe) no case out of eight showed improvement.

Under $ZnSO_4$ therapy, the diplobacilli all disappeared but in 15 out of 18 cases the diplococci and the clinical signs and symptoms persisted.

Vitamin-B_6 therapy was tried in two cases (30 mg. daily, subcutaneously for seven days) without effect.

Penicillin ointment, one mg. per gm. was used two or three times a day in 12 cases, seven of which had been treated ineffectively with $ZnSO_4$, and all responded dramatically within a few days. Bacteriologically, both diplococci and diplobacilli disappeared within three days. It should be noted that usually penicillin does not affect diplobacillary conjunctivitis so effectively.

Streptomycin ointment (0.5 mg. per gm., two times daily) was used in three cases of this series and found superior to penicillin. Since streptomycin is just as effective in diplobacillary conjunctivitis, there was no comparative significance therapeutically.

Bacteriologic studies

The isolation of diplococci on culture plates was difficult because the small colonies were obliterated by the rapidly growing staphylococcus. A serum agar plate containing three mg. crystal violet per kg. was found to impede the staphylococcus growth and yet not hinder the growth of the diplococci. Seven strains were isolated from seven patients.

Diplococci are facultative aerobes. They grow feebly on ordinary agar plate but grow well on blood or serum agar plates. Colonies on blood agar plate after 24 hours' incubation appear as a "dew drop." After 48 hours' incubation, the colonies are 0.2 to 0.3 mm. in diameter and appear wet and transparent.

In serum broth, they produce granular deposits and leave the broth clear. These deposits do not dissolve completely on shaking. There is doubtful or no hemolysis on blood agar plate. On Smith-Brown pour plate there is alpha-type hemolysis. On chocolate agar there is greening without discoloration of the media.

Diplococci ferment dextrose, saccharose, and maltose, but not lactose or inulin. They do not liquefy gelatin or Löffler's medium. Bile does not dissolve the organism.

In culture this organism usually occurs in

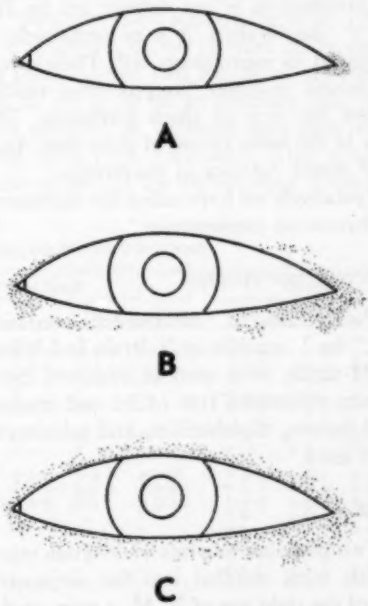

Fig. 2 (Mitsui, Hinokuma, and Tanaka). Clinical forms of micrococcal blepharitis. From the top, A-form, B-form, C-form.

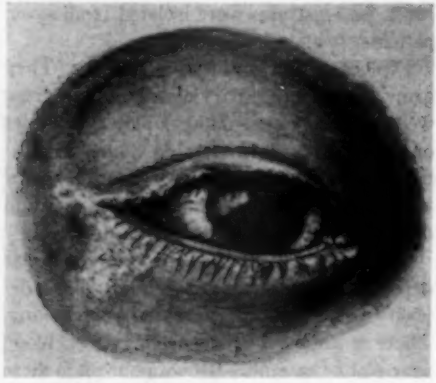

Fig. 3 (Mitsui, Hinokuma, and Tanaka). Micrococcal blepharitis. (Case 6 in Table 1.)

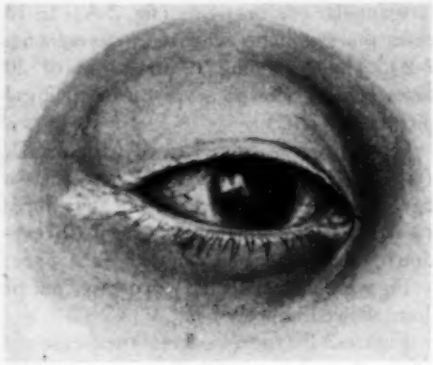

Fig. 4 (Mitsui, Hinokuma, and Tanaka). Inoculated micrococcal blepharitis (Case 4) 10th day after inoculation.

pairs. Some do occur occasionally in groups but do not form chains even in broth media. On repeated subculture they are apt to become smaller in size.

This diplococci is not pathogenic to rabbits or mice.

Classification is not definite but by Bergey's[6] classification it may tentatively be identified as micrococcus SP. These microorganisms resemble Streptococcus viridans except for lack of chain formation. They may be the same as one of those that Axenfeld[3] terms "sarcina in conjunctiva."

Tentatively we have called this diplococcus "Micrococcus conjunctivae."

Inoculation studies

Two strains of "Micrococcus conjunctivae," the Yamashita or Y-strain and Murata or M-strain, were used as inoculum. Seven human volunteers free of lid and conjunctival lesions, diplobacillus, and micrococcus were used.

Case 1

Two platinum loopfuls of Y-strain micrococcus were instilled into the conjunctival sac of the right eye of Y. M., a man, aged 54 years. Blepharitis of outer canthus appeared in four days along with a catarrhal conjunctivitis.

Examination of smears showed two-plus micrococcus and one-plus diplobacillus. On the eighth day the clinical picture was that of a full-blown angular conjunctivitis with the smears showing more micrococcus.

Case 2

Two loopfuls of Y-strain were instilled into the conjunctival sac of the right eye of S. H., a man, aged 60 years. An itching sensation was complained of on the seventh day and clinically a slight dermatitis of the outer canthus was noted.

Smears showed one-plus micrococcus and one-plus diplobacillus. After one month, there was a severe angular blepharoconjunctivitis with the whole lid margins involved.

Case 3

Two loopfuls of M-strain were inoculated into the left eye of R. S., a woman, aged 21 years, and repeated the next day. Mild dermatitis of the outer canthus was noted on the third day.

Smears showed three-plus micrococcus and two-plus diplobacillus. From the fifth day the erosion of the lid margin started to spread. Blood agar cultures of the smear were positive for micrococcus.

$ZnSO_4$ therapy (one-percent solution, five times daily for seven days) was started

on the 15th day but was ineffective. However, diplobacilli disappeared from the smear. On penicillin ointment (one mg. per gm.), the blepharoconjunctivitis cleared in four days.

Case 4

Two loopfuls of M-strain were inoculated into the left eye of Y. S., an eight-year-old girl, and repeated on two successive days. Beginning angular conjunctivitis was noted on the fourth day.

Smears at this time showed three-plus micrococcus with no diplobacillus. Subacute conjunctivitis was noted on the ninth day and smears at this time showed two plus diplobacillus for the first time.

$ZnSO_4$ therapy was started on the 14th day and, after 11 days, diplobacilli completely disappeared but clinically there was no improvement. On the 25th day vitamin B_6 (30 mg. daily) was given for seven days but was ineffective. Penicillin therapy for five days immediately cleared the eye.

Cases 5 and 6

The eyes of K. M., a four-year-old girl, and Y. I., a three-year-old girl, were inoculated with Y-strain but there were no "takes" up to the seventh and 10th day respectively.

Case 7

M-strain was used as inoculum in Y. N., a boy, aged 13 years, but up to the 14th day results were negative.

Comment

Results of these human inoculation studies seem to indicate that micrococcus is also important as an etiologic agent of angular blepharoconjunctivitis and that it causes more severe symptoms than diplobacillus. In such cases the role of the diplobacillus in the etiology of angular conjunctivitis may be purely supportive to the micrococcus. Thus "micrococcal blepharoconjunctivitis" may be a better term here. The relationship between the two types of blepharoconjunctivitis seems to be as summarized in Table 5.

Diplobacillary-Micrococcal Relationship

To determine this relationship cross-line cultures of these two organisms were studied. However, there appeared to be no difference in growth of the colonies at the crossing points. Next, two strains of diplobacilli that do not grow on an ordinary agar plate were cultured on ordinary agar plate combined with pure micrococci. This resulted in the growth of the diplobacillus. From this

TABLE 4

Biologic characteristics of micrococcus conjunctivae

		Micrococcus Conjunctivae Strain							Control		
		1	2	3	4	5	6	7	Stp	Str	Pn
Growth on	Agar	+	+	+	+	+	+	+	+	+	+
	Blood-agar	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++
	Serum-agar		+++	+++	+++	+++	+++	+++	−	+++	+++
	Crystalviol-serum-agar	/									
	Bouillon	+	+	+	+	+	+	+	+++	+++	+
Hemolysis on blood agar plate		−	−	+	−	−	+	−	+++	+++	−
Hemolysis in Smith-Brown's pour plate		/	α	/	α	α	/	α	/	β	/
Greening on chocolate agar		/	+	+	+	+	+	+	−	+	++
Fermentation of	Glucose	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++
	Saccharose	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++
	Maltose	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++
	Lactose	−	−	−	−	−	−	−	++	++	++
	Inulin	/	−	−	−	−	−	−	−	−	+++
Milk	Acid formation in	−	−	−	−	−	−	−	+++	++	++
	Coagulation of	−	−	−	−	−	−	−	+++	++	++
Liquefication of gelatin		/	−	−	−	−	−	−	+++	−	−
Bile solubility		/	−	−	−	−	−	−	/	−	+

Stp: Staphylococcus, isolated from conjunctiva
Str: Streptococcus hemolyticus, isolated from conjunctiva
Pn: Pneumococcus, isolated from conjunctiva
/: Not tested

TABLE 5

RELATION BETWEEN MICROCOCCAL AND DIPLOBACILLARY BLEPHAROCONJUNCTIVITIS

	Diplobacillary Blepharo-conjunctivitis	Micrococcal Blepharo-conjunctivitis
Agent in chief	Morax-Axenfeld's Diplobacillus	Micrococcus conjunctivae
Predisposition	Deficiency in Vitamin B_6, etc.	Unknown
Associate agent	Micrococcus conjunctivae	Morax-Axenfeld's Diplobacillus
Clinical symptoms	Slight	Severe
Effectiveness of		
$ZnSO_4$	+++	−
Vit. B_6	++	−
Penicillin	+	+++
Streptomycin	++++	++++

there appears to be no doubt as to the close symbiotic relationship between these two organisms.

From these findings, mixed inoculations were done in two cases. One case resulted in a typical blepharoconjunctivitis of the micrococcal type. The other case did not take after three repeated inoculations.

Staphylococcus occurs in diploform (measures 0.5 to 1.0 micron, smaller than micrococcus) in the discharge and is invariably present in smears and cultures from angular conjunctivitis cases and so it must be considered. Staphylococcus aureus and albus, isolated from cases of angular blepharoconjunctivitis, were inoculated in four eyes of human volunteers but no angular blepharitis or conjunctivitis resulted.

SUMMARY

Angular conjunctivitis has always been considered to be due to a specific organism, Morax-Axenfeld's diplobacilli. This study seems to indicate strongly that micrococcus is a more violent etiologic agent.

Careful and repeated examination of smears from angular blepharoconjunctivitis with Gram stain very often shows micrococcus along with the diplococcus. These two organisms appear in varying proportion with the more severe angular conjunctivitis showing more micrococci.

Therapeutic tests with $ZnSO_4$, penicillin, and vitamin B_6 show that chemotherapy aimed at the micrococcus results in a quick cure. In severe cases $ZnSO_4$ has no effect except to remove diplobacillus from the smears.

Both of these organisms are saprophytes of the human eye and are present in a close symbiotic relationship. The factors that make these organisms pathogenic are not clearly known but vitamin B_6 deficiency may be a factor for diplobacillus but not for micrococcus.

It is not unlikely that three forms of angular conjunctivitis exist, namely those due to micrococcus, diplobacillus, and a mixed type. This distinction of types is not clear cut.

There appears to be no doubt that micrococcus is an important organism in the etiology of angular conjunctivitis.

ACKNOWLEDGEMENT

We wish to thank Dr. Phillips Thygeson and Dr. Samuel J. Kimura for their help in the preparation and publication of this paper.

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MALIGNANT EXOPHTHALMOS*

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Malignant exophthalmos is a progressive bilateral exophthalmos usually assumed to be associated with a disturbance in the functional state of the thyroid gland. While this definition may be considered to be generally valid, the present case shows that a condition which clinically falls under the classification of malignant exophthalmos can be present occasionally without any evidence of thyroid disease.

REPORT OF A CASE

History. The patient, a white man, aged 60 years, was first admitted to Montefiore Hospital on March 5, 1947. His only complaint was a "progressive swelling of both eyes."

He was born in Russia; emigrated to the United States at the age of 20 years and has since resided in New York City. He was a butcher and retired at the age of 50 years. His personal and family history were otherwise irrelevant.

In 1910, at the age of 23 years, he was rejected for a life insurance policy because of a heart murmur, though asymptomatic. In 1938 and again in 1944, he was admitted to a city hospital with a diagnosis of coronary thrombosis and cardiac decompensation.

Present illness. The patient first became aware of the undue prominence of his eyes in 1941. He felt that the condition had been slowly progressive until 1945 when the "swelling" became increasingly severe. During the year prior to hospitalization, there were associated headaches with double vision on reading. He had attended the out-patient clinics of various city hospitals and his basal-metabolism in 1943 was reported as normal.

Physical examination. The patient was a poorly nourished but fairly well-developed white man and appeared to be somewhat younger than the stated age of 60 years. He was intelligent and coöperative.

He had a very marked bilateral exophthalmos with exposure conjunctivitis of the right eye. His neck was supple and the trachea was in the midline. The thyroid gland was neither enlarged nor palpable. There was no lymphadenopathy. He had moderate venous engorgement of the vessels in the neck.

His lungs were normal. The heart was enlarged but the rhythm was regular and the rate was 72. There was a blowing systolic murmur at the apex and at the base and a long, low-pitched rumbling diastolic murmur at the apex.

The liver edge was at the costal margin and not tender. The prostate was moderately enlarged. He had a coarse tremor of the upper and lower extremities. There was one plus ankle edema. The blood pressure was 150/98 mm. Hg.

Eye findings. The patient did not use glasses until the age of 52 years and then only for reading. Visual acuity was: R.E., 20/70; L.E., 20/40, not improved by glasses.

There was a very marked bilateral proptosis and exophthalmos. The Hertel exophthalmometer readings with a base line of 110 mm. were 35 mm. in the right eye and 33 mm. in the left eye. He had an exposure conjunctivitis of the right eye.

Excursions of both upper lids were relatively good and ocular motility was well maintained in all fields. With the red glass test, crossed diplopia was elicited on right and left lateral gaze. Ocular tension was within normal limits.

Apart from moderate narrowing of the

* This study was done in the Montefiore Hospital Eye Laboratory and was supported in part by the William L. Hernstadt Fund. Read before the Section on Ophthalmology, New York Academy of Medicine, May, 1950.

Fig. 1 (Medine). Upper photograph shows appearance of patient at the time of admission to Montefiore Hospital. Lower photograph was taken three years after the completion of surgical and radiation therapy.

Fig. 2 (Medine). Lateral views of the patient's right eye prior to treatment and three years after completion of all therapy.

retinal arteries, the fundi were negative and the media were clear. There was a moderate cushioned resistance as the globes were pushed back in.to the orbits. No ocular signs of hyperthyroidism could be elicited. There was no retraction of the upper lids; in fact, his lids tended to droop (figs. 1 and 2).

Other findings. The electrocardiogram showed a left axis deviation and auricular flutter of a 3:1 ratio. Repeated basal metabolism examinations varied between −9.0 percent and −24 percent. The sella turcica and optic foramina were radiographically normal and there was no X-ray evidence of a substernal thyroid.

Urine and blood findings were within normal limits. Blood serology was negative. Blood cholesterol, sugar, and urea nitrogen determinations were normal. Spinal tap and fluid examinations were negative.

Studies with tracer doses of radioactive iodine were done on two occasions and the uptake was within normal limits.

Course. In view of the progressive exposure conjunctivitis, which threatened to endanger the patient's vision, a Naffziger operation was performed by Dr. Leo Davidoff in March, 1947.

A bilateral transfrontal craniotomy with decompression of the orbital roofs was done under avertin and intratracheal ether anesthesia. On opening the orbital roof to an area of about 2.5 cm., the orbital fascia bulged through the defect. This was incised and the orbital contents decompressed themselves quite markedly into the cranial fossa. The procedure was done bilaterally and was uneventful, as was the patient's postoperative course.

The muscles within the orbit appeared swollen and a specimen of the levator muscle was removed for histologic examination (fig. 3).

Histologic report. Dr. S. H. Rosen reported:

"Specimen is a section of striated muscle. The muscle fibers are rather widely separated by a loose fibrillar connective tissue in the interstices of which can be seen some granular and less homogeneous pink-staining material. The latter is apparently edema of moderate degree. The connective tissue itself shows little or no increase in cellularity or in collagen fibers.

"There are, however, several small and large focal infiltrations of lymphocytes with fewer plasma cells and an occasional polymorphonuclear leukocyte, usually in perivascular position. A few scattered cells of this type are also seen here and there in the stroma. On the whole this cellular infiltration is only of moderate degree.

"Degeneration of muscle fibers is more pronounced. Cross striations are for the most part either poorly defined or entirely lost. Many fibers show patchy loss of fibrillation,

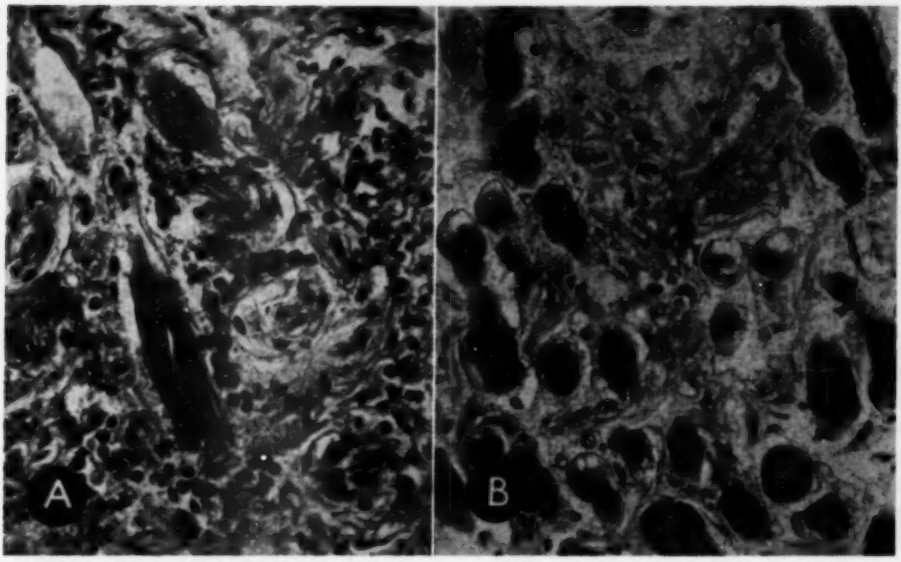

Fig. 3 (Medine). Two fields of section of levator muscle obtained during Naffziger operation.

and coarse granularity and vacuolization of the sarcoplasm.

"In some instances sarcolemma sheaths enclose large irregular vacuoles or clear spaces with only a small amount of coarsely granular protoplasm at the periphery or center. Some of the vacuoles contain pale pink-staining material suggesting intracellular edema. Some fibers are completely disintegrated and a few show hyaline degeneration.

"Muscle and sarcolemma nuclei are frequently pyknotic and the former are occasionally centrally located. Although a few fibers appear to show slight proliferation of sarcolemma nuclei, this process is inconspicuous. Nerve fibers also show degenerative changes. With the hematoxylin-eosin stain this appears to consist principally of myelin degeneration with perhaps some edema.

"The changes in the eye muscle are consistent with those described in the myopathy of malignant exophthalmos of fairly advanced degree. I do not believe they can be considered specific."

The exophthalmos which preoperatively had been 35 mm. in the right eye and 33 mm. in the left eye receded to 24 mm. in both eyes within 20 days. However, seven weeks postoperatively, the proptosis began to increase and the exophthalmos became 31 mm. in the right eye and 29 mm. in the left eye.

In view of the progression of the exophthalmos and the fact that the biopsied muscle showed extensive lymphocytic infiltrations, it was decided to give the patient a course of X-ray treatments over the right lateral retro-orbital and anterior orbital fields.

A total of 900 r to the anterior and 1,700 r to the lateral fields were given between May 17 and June 9, 1947. At the end of treatment the exophthalmos had receded from 31 to 28 mm. The exophthalmos of the left eye was now the more severe and in August, 1947, this was treated with 1,100 r to the anterior and 1,300 r to the lateral fields and the exophthalmos receded from 29 to 26 mm. (fig. 4).

Discussion

The case described falls into the classification of malignant exophthalmos, both from

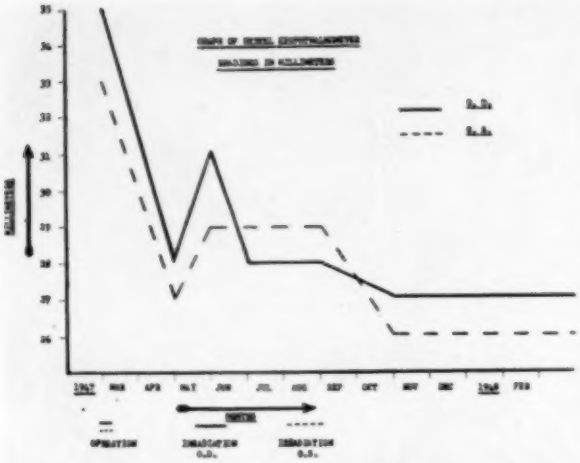

Fig. 4 (Medine). Patient's Hertel exophthalmometer readings in graph form. The curve has remained unchanged to May, 1950, when patient was last examined.

the clinical picture and from the histologic findings of the biopsied muscle tissue. This type of malignant exophthalmos is typically seen following thyroidectomy in individuals whose manifestations of thyrotoxicosis were mild but who initially may have presented a small degree of exophthalmos. At the time of the progression of the exophthalmos the basal metabolism is either normal or low.

It has been postulated on the basis of extensive experimental studies that the thyrotropic hormone of the anterior pituitary plays a role in the etiology of the exophthalmos, its effect presumably being enhanced by removal of the thyroid gland.

Mulvany[1] stated that one should distinguish between two types of exophthalmos, the thyrotoxic type associated with an excess of thyroid hormone, and the thyrotropic type, in which there is an excess of thyrotropic activity. Malignant exophthalmos is usually of the latter type.

Mann[2] published a report of many cases of exophthalmos in which she showed that there is no clear-cut differentiation between the two types as described by Mulvany.

Means[3] believes that malignant exophthalmos differs only in degree from the exophthalmos usually associated with Graves's disease. He calls attention to the experimental production of exophthalmos by anterior pituitary extracts and raises the question as to whether the factor responsible for the exophthalmos is identical with the factor which stimulates the thyroid gland, that is, the thyrotropic hormone.

Recently, Jefferies[4] produced highly suggestive evidence of the existence of two separate factors in animals, one being responsible for the exophthalmos and the other one exerting a stimulative action on the thyroid gland.

In the case reported here it was not possible to show any abnormality of thyroid function, nor was it possible to demonstrate any disturbance in the relationship between the thyrotropic hormone and the thyroid gland.

In view of this one may justifiably assume that, in this patient, there was an excessive production of the pituitary factor responsible for the exophthalmos without a clinically significant increase in the thyrotropic factor.

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CLINICAL TRIAL OF AUREOMYCIN IN TRACHOMA*

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Beyrouth, Lebanon

The encouraging results reported by Moutinho and others and by Boase on the use of aureomycin in the treatment of trachoma inspired the present study.

In Lebanon, trachoma is a major public health problem. Out of a general population of 1,200,000, there are 180,000 cases of trachoma. The disease is unevenly distributed. In the poorer part of the country, known as South Lebanon, the incidence is as high as 70 percent; in other parts of the country it is from one to five percent. South Lebanon takes in about 20 percent of the area of the country and about 20 percent of the inhabitants.

Since mass treatment of trachoma was the main objective of this study, this factor was kept constantly in mind during the investigation.

CHOICE OF DRUG

To be suitable for mass treatment a drug must be (1) inexpensive, (2) easy to administer, and (3) without toxic effects.

Since aureomycin tablets for oral use are not only too expensive but also too dangerous to use on a wide scale, and aureomycin drops are impractical because they must be used from four to six times a day, ointment† was selected as the most suitable medium for the antibiotic.

CHOICE OF PATIENTS

The patients came from the Lebanese Red Cross out-patient clinic of Mussaitbe, Beyrouth. This clinic is attended mainly by patients from South Lebanon.

The patients were unselected; all new cases of Trachoma I, II, and III having no previous treatment were given aureomycin.

The diagnosis was made by examination of the lids with a binocular loupe and by slitlamp examination of the cornea. Cases which did not show a typical pannus invasion of the cornea were not included in this study.

A careful recording was made of the condition of the lids, conjunctiva, and cornea of each case. Patients were instructed to use the ointment in a small quantity twice a day, to report every day for examination for one week, then every week for a period of two months. Patients who did not attend the clinic regularly were not included in this report.

A total of 35 patients were given aureomycin; 30 had no other form of treatment; five had had, at various times, one course of sulfonamide by mouth.

The ointment was well tolerated by all the patients. We had no allergic reaction or toxic manifestation from its use over a period of two months.

FIRST SERIES

This series included 30 patients who received aureomycin ointment only. In it were one case of early Trachoma I, four cases of Trachoma I, 16 cases of Trachoma II (seven cases of very severe and nine cases of early Trachoma II), five cases of Trachoma II to III, and four cases of Trachoma III. There were 19 males and 11 females.

The patients with Trachoma I were all under the age of 14 years. The ages of patients with Trachoma II varied between seven and 22 years. Trachoma III was found in patients between 14 and 40 years of age.

COMPLICATIONS

1. There were two cases of bilateral trachomatous corneal ulcers in patients suffer-

* This paper was presented before the II Congress of the Syrian Ophthalmological Society, Aleppo, Syria, May, 1951.

† Upon request, the Lederle Laboratories (American Cyanamide Company, New York) generously supplied us with tubes containing one-eighth ounce of a 1:1,000 ointment specially prepared for ophthalmic use.

ing from Trachoma II (one boy, aged 15 years, and one girl, aged 17 years).

2. There were three cases of bilateral pannus crassus in three young women, aged 19, 20, and 22 years. All three were suffering from Trachoma II, and were breast feeding.

Results

1. *From the second to the seventh days of treatment* all cases showed a marked subjective improvement. The patients were relieved of photophobia, lacrimation, and pain. Their general appearance was much improved; they no longer walked with their heads bent to avoid the light, protecting their eyes with a piece of cloth.

Locally, the congestion was greatly diminished; all eyes but four looked white. The palpebral conjunctiva was thinner, less congested, and looked more healthy. Papillary hypertrophy was much less marked. In all but two cases the "sago grains" were unchanged.

2. *From the seventh to the 30th days,* in two cases of Trachoma I the follicles disappeared without leaving scars (one boy, aged seven years, in 15 days; one girl, aged 10 years, in 21 days).

The others showed very slight improvement. However, the subjective and objective improvement of the first week was maintained in all cases.

3. *From the 30th to the 60th days,* there was still a slight improvement in cases of Trachoma I and II, which showed the papillas and the follicles to be diminished in size. In four cases of early Trachoma II fine criss-cross scars appeared at the sites of the follicles. All cases of Trachoma III were unchanged.

4. *On the 60th day,* all patients were examined again with the slitlamp. Pannus formation was detected in all cases except the two considered as clinically cured, but the pannus was less marked and often difficult to see even with the slitlamp.

On the complications. (1) All the corneal ulcers healed on the fourth day and did not stain with fluorescein. (2) The pannus crassus improved greatly in the first five days, then diminished slowly. On the 60th day the pannus crassus of the three cases was reduced to normal pannus, which could not be considered a complication. A great improvement was noted in the visual acuity. The three patients continued to breast feed, and had no other form of treatment (tonics, milk, or better diet).

Second series

This series included five male patients, suffering from severe Trachoma II, with bad pannus, much photophobia, and lacrimation. For 15 days they had aureomycin treatment only.

Results

On the 15th day, the subjective symptoms had disappeared; the conjunctivas were much better; the papillary hypertrophy was flattening, but the "sago grains" were unchanged and there was no evidence of scarring.

The patients then had a course of sulfathiazole (one gm., three times daily, orally, for 10 days).

On the 25th day, a remarkable improvement was noted. Numerous fine criss-cross scars were noticeable, centered on the follicles, which were disappearing.

Sulfathiazole was discontinued and aureomycin resumed.

On the 60th day, all cases were nearly cured. The pannus was detectable only with the slitlamp. The five cases looked like cases of Trachoma III going to Stage IV.

Comments

The action of aureomycin on secondary infection seemed to be very marked, and moderate on the trachoma itself. This action was very similar to that of sulfonamide taken orally, but much more rapid, resembling in speed the action of penicillin.

Aureomycin seems to act best on Tracho-

ma I and early Trachoma II. It may be possible to obtain a cure of these two forms using aureomycin ointment only. For severe cases of Trachoma II, sulfonamide orally is still indicated in addition to local treatment with aureomycin.

On the complications—pannus crassus and corneal ulcers—aureomycin is very effective.

In general, our findings were similar to those of Boase but not so spectacular as the results obtained by Moutinho and his co-workers. The best dosage of aureomycin ointment (1.0, 2.0, 5.0 mg. per gm.) still remains to be decided.

Conclusions

From this study it would appear that aureomycin ointment is the most suitable drug for mass treatment of trachoma. It offers the following advantages: (1) Low price, (2) no toxic effects, (3) rapid action on secondary infections and on complications, (4) sustained action on trachoma itself, (5) ease of administration. These advantages should recommend aureomycin for mass treatment of trachoma.

21 Rue de France.

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A PRELIMINARY REPORT ON A NEW CYCLOPLEGIC AND MYDRIATIC DRUG*

Robert D. Kiess, M.D., and F. Bruce Fralick, M.D.
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In the quest for a new cycloplegic and mydriatic drug outside the atropine series, the Department of Pharmaceutical Chemistry at the University of Michigan† developed a compound, B-diethylaminoethyl cyclohexyl-2-thienylhydroxyacetate nitrate (C_6H_5) (C_4H_3S) C-(OH)$COOCH_2CH_2N$-$(C_2H_5)_2 \cdot HNO_3$, in the hope that it might be substituted for atropine sulfate in patients with a known idiosyncrasy or who, under treatment, had developed a sensitivity to the drug.

For the experiments at the University Hospital, B-diethylaminoethyl cyclohexyl-2-thienylhydroxyacetate nitrate was prepared in a 1.5-percent solution of the nitrate salt with a pH of 5.5 from the dry powdered drug. The drug in this type of solution appeared to be quite stable, maintaining its potency over a six months' period.

Selection of cases

B-diethylaminoethyl cyclohexyl-2-thienylhydroxyacetate nitrate was first used as a substitute for atropine sulfate in two cases of acute iridocyclitis which had developed an atropine dermatitis. However, its mydriatic and cycloplegic power in both cases was found to be totally inadequate so that its use had to be discontinued.

It was then used as a mydriatic and cyclo-

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* From the Department of Ophthalmic Surgery, University of Michigan Medical School.

† Initially prepared under the direction of F. F. Blicke, Ph.D., Department of Pharmaceutical Chemistry, University of Michigan, and supplied through the courtesy of the Sterling-Winthrop Research Institute.

plegic drug in routine refractions. For this purpose, 50 selected patients between the ages of 15 and 30 years were studied. One drop of the B-diethylaminoethyl cyclohexyl-2-thienylhydroxyacetate nitrate was instilled on the cornea of each eye every 15 minutes for three doses. The amplitude of accommodation was then determined at 15-minute intervals after the original instillation for the first hour, then at two hours, four hours, 24 hours, and 48 hours after starting the original drops.

The amplitude of accommodation was determined by the push-up method for each eye, with the patient's glasses in place before the eyes, providing any glasses were worn.

The push-up method consisted of occluding one eye and determining the nearest distance to the eye at which J1 print could be read. This distance was then determined in centimeters and converted to its dioptric equivalent. The process was then repeated for the other eye.

In order to obtain the most accurate appraisal of the cycloplegic value of the B-diethylaminoethyl cyclohexyl-2-thienylhydroxyacetate nitrate, any change in spherical power found under cycloplegia was used as the patient's true refractive findings. Hence the cycloplegic values of the drug, as shown on the accompanying graphs, have been corrected to include the full cycloplegic error as if it had been used in all determinations.

The subjective and objective symptoms produced by instillation of the drug were also noted. Subjectively, all but two patients reported smarting and burning of the eyes following the original instillation of the drug. However, this markedly decreased upon each successive instillation of the B-diethylaminoethyl cyclohexyl-2-thienylhydroxyacetate nitrate. Only five patients complained of smarting and burning when the third drop was instilled on the cornea. There were no instances of nausea or generalized reaction to the drug.

Objectively, 10 cases showed a mild hyperemia of the conjunctiva one hour after the original instillation of the drug. Forty patients reported diminished corneal sensitivity when

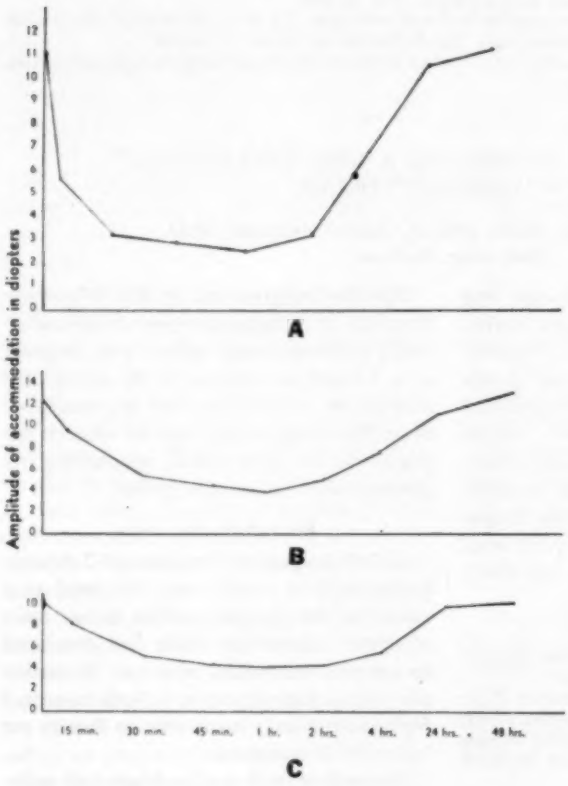

Fig. 1 (Kiess and Fralick). (A) Forty cases (80 eyes). One drop instilled on each cornea every 15 minutes for three doses. (B) Five cases (10 eyes). One drop instilled on each cornea every 15 minutes for two doses. (C) Five cases (10 eyes). One drop instilled on each cornea.

tested by a wisp of cotton. Objectively the reduction in corneal sensitivity appeared to be around 25 percent (3+ in cases with drops, and 4+ without drops). The amount of mydriasis produced by the drug varied from good to excellent. The over-all variation in the size of the pupils was two mm. with the mean dilatation being seven mm.

Figure 1-A, B, and C illustrates the cycloplegic effect of B-diethylaminoethyl cyclohexyl-2-thienylhydroxyacetate nitrate (1.5-percent solution).

Summary of findings

1. In two cases of acute iritis, which had developed an atropine dermatitis, an attempt was made to use B-diethylaminoethyl cyclohexyl-2-thienylhydroxyacetate nitrate instead of atropine. However, the cycloplegic and mydriatic power of the drug was found to be inadequate.

2. After instillation of three drops of 1.5-percent B-diethylaminoethyl cyclohexyl-2-thienylhydroxyacetate nitrate at 15-minute intervals, the residual amount of accommodation was 2.5 diopters. Pilocarpine (two percent) was instilled in the eye after refraction and, 24 hours later, there was found to be approximately one-diopter residual cycloplegic power of the drug remaining.

3. When two drops of 1.5-percent B-diethylaminoethyl cyclohexyl-2-thienylhydroxyacetate nitrate were instilled at 15-minute intervals, the residual of accommodation at one hour was three diopters. Pilocarpine was instilled after refraction, the amplitude of accommodation determined after 24 hours, and again one diopter residual cycloplegic power of the drug remained.

4. Instilling only one drop of 1.5-percent B-diethylaminoethyl cyclohexyl-2-thienylhydroxyacetate nitrate on the cornea resulted in a residual amplitude of accommodation of four diopters after one hour. Pilocarpine (two percent) was instilled in the eye after refraction and, 24 hours later, the amplitude of accommodation had returned to normal.

Conclusions

1. B-diethylaminoethyl cyclohexyl-2-thienylhydroxyacetate nitrate (1.5 percent), when used in the amount of three drops at 15-minute intervals, proves to be a fairly satisfactory mydriatic and cycloplegic drug in routine refractions. It should be the drug of choice in patients with a known atropine or homatropine idiosyncrasy. Its cycloplegic value, however, is less than that of a combined five-percent homatropine and one-percent paredrine solution.*

2. The side effects of burning and reduced corneal sensitivity are almost constant but not severe and therefore are not a contraindication to the use of the drug.

3. The maximum mydriatic and cycloplegic effect of B-diethylaminoethyl cyclohexyl-2-thienylhydroxyacetate nitrate, when used either in doses of one, two, or three drops, appears to occur at approximately one hour after the original instillation. Therefore, this would appear to be the optimum time to perform a cycloplegic refraction.

4. B-diethylaminoethyl cyclohexyl-2-thienylhydroxyacetate nitrate does not possess sufficient cycloplegic or mydriatic values to be used as an alternate drug in the treatment of acute iritis.

5. There is a need for still further research for a drug outside the atropine series which possesses sufficient mydriatic and cycloplegic power that it may be used to replace the use of atropine in atropine sensitive patients.

University Hospital.

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* Weinman and Fralick; Am. J. Ophth., **23**:172 (Feb.) 1940.

NOTES, CASES, INSTRUMENTS

INVERSIO PAPILLAE WITH ALTITUDINAL FIELDS*

Report of a case

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Congenital anomalies of the optic disc are not rare. Their differentiation from acquired pathologic conditions of the discs is important but usually not too difficult. The following case report presents an unusual anomaly of the disc.

Case report

History. A 48-year-old white man (J. R. M.) was first seen on July 6, 1949, complaining of blurred distance vision. He stated that for an indefinite period he had not been able to see well to the side when looking straight ahead; also, that all his life he had at different times struck his head on low-hanging objects. He complained of migraine headaches for a duration of many years. There was a negative family history of eye trouble.

Eye examination. The external eye was normal. Vision in the right eye was 20/180, correctible to 20/20− with a −2.25D. sph. ⌒ +1.25D. cyl. ax. 172°; and in the left eye, it was 20/160, correctible to 20/20− with a −2.0D. sph. ⌒ +1.0D. cyl. ax. 30°.

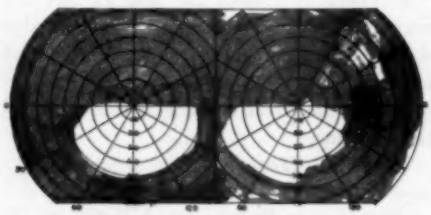

Fig. 3 (Veirs). Peripheral field studies for 2/330, showing complete absence of the upper half of the visual field.

The intraocular pressure in the right eye was 40 mm. Hg (Schiøtz), and in the left it was 46 mm. Hg.

The funduscopic examination was essentially normal except for the optic discs. The nerve tissue had a quarter-moon shape about one third the size of a normal disc, and it occupied the superior temporal region of the disc.

The inferior nasal two thirds or more of the disc area was apparently devoid of optic-nerve tissue. This area had a grayish appearance, the part nearest the nerve having a dirty-gray color, and the most inferior nasal portion having a grayish-white appearance.

The retinal vessels were directed toward the nasal side rather than to the temporal side. They appeared normal in every other respect, as did the remainder of the fundi (figs. 1 and 2).

The visual fields in both eyes showed an altitudinal pattern. The upper half of the field in both eyes was absent (fig. 3).

The general physical and neurologic examinations were negative. X-ray studies of the skull and sinuses were also negative.

The patient was put on one-percent pilocarpine, which lowered the intraocular pressure to within normal limits, and he was referred to his local ophthalmologist.

He was next seen on January 13, 1950, at which time there had been a little deterioration of the central visual acuity, as well as of the field of vision. The pressure at that time was 20.1 mm. Hg (Schiøtz) in the right eye and 27.1 mm. Hg in the left.

Dr. Derrick Vail saw this patient in consultation on January 20, 1950, and he described the nerveheads as being congenitally inverted. The intraocular pressure at that time was 30 mm. Hg (Schiøtz) in the right eye and 35 mm. Hg in the left. Dr. Vail did not believe the altitudinal field defect was connected with the glaucoma in any way but

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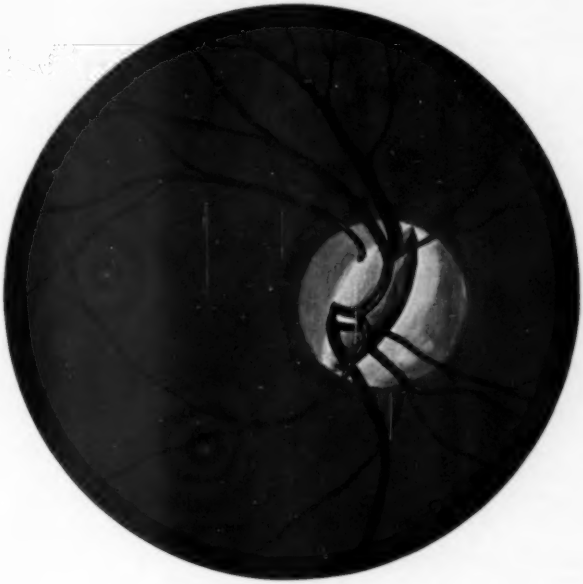

FIG. 1

FIG. 2

FIG. 1 (VEIRS). DRAWING OF RIGHT EYE SHOWING QUARTER-MOON-SHAPED NERVE TISSUE IN THE UPPER NASAL PORTION OF THE DISC. THE VESSELS ARE DIRECTED NASALLY INSTEAD OF TEMPORALLY.

FIG. 2 (VEIRS). DRAWING OF LEFT EYE SHOWING ANOMALY SIMILAR TO THAT OF THE RIGHT EYE.

that it might be associated with the peculiar angle of entrance of the nerve fibers, in that the fibers coming from the lower retina in each eye had probably been crowded and compressed by the knee-bend of the optic nerves.

A trephination was performed on the left eye on January 30, 1950, and on the right eye on March 8, 1950. The postoperative course of both eyes was uneventful.

Scott and White Clinic.

RETINAL DETACHMENT

SPONTANEOUS REATTACHMENT FOLLOWING AUREOMYCIN THERAPY

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The therapeutic action of the antibiotics in many ocular conditions daily becomes better known to ophthalmologists. A striking example is herein presented. In a case of retinal detachment in a young man, detachment occurred above three months after successful surgical reattachment below. Aureomycin therapy for a fortnight was followed by complete reattachment.

REPORT OF CASE

History. M. L. T., aged 31 years, a pressman in a newspaper office, was referred by Dr. H. Doyle Solomon of St. Petersburg, on February 16, 1949, with a diagnosis of detached retina in the left eye. His only complaint, hazy vision in this eye for three or four weeks, he had attributed to strain. Two months previously, a foreign body had been washed from the eye in the newspaper office. The eye had become somewhat bloodshot, and there had been some burning but no excessive lacrimation.

As he was moderately nearsighted, the patient had worn glasses since 1939. Otherwise, the ocular, general, and family history were irrelevant.

External examination of the eyes gave negative results. There were present in the fundus of the right eye small, quiescent, discrete, old chorioretinitic areas in the far periphery below, with some deposition of pigment.

In the left eye there was no evidence of pathologic change in the region of the disc or macula. There was, however, some pigment clumping beginning at a level of four disc diameters below and six disc diameters to the nasal side of the papilla.

Below this area, particularly nasally, there was a rather high retinal detachment to the nasal side. The retina in this area was viewed with a +8.0D. lens in the ophthalmoscope. The detachment, extensive to the lower nasal side, extended well over to the temporal side at about the same upper level and out into the periphery on the nasal side.

Multiple holes were seen at the 7-o'clock meridian about five to six disc diameters in from the limit of the visible fundus under wide pupillary dilatation induced by subconjunctival injection of cocaine, adrenalin, and atropine.

There were multiple cystic areas in this region and, apparently, a slight tendency to retinitis proliferans. The overlying vessels, particularly to the nasal side where the elevation was higher, were of typical black appearance. No folds were present. There was little movement to the detachment; it seemed to be rather firm. The upper portion of the retina was of fairly good appearance.

In both eyes there was some lack of pigment above. The vitreous structure was about the same. There was some fibrillar thinning and some tendency to granulation anteriorly; however, no gross opacities could be seen with the biomicroscope. No opacities of consequence could be made out ophthalmoscopically. Tension was 26 mm. Hg (Schiøtz) in each eye. Transillumination of the globe in the left eye gave essentially negative results.

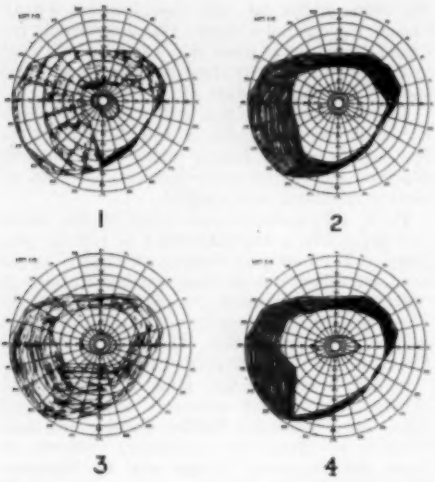
The peripheral field in the right eye was normal for form and color, as was the central field, the blindspot being 5.5 by 7.5 degrees. In the left eye, the whole upper part of the field was blocked out. The central vision was maintained, and a fairly satisfactory lower portion of the nasal field was present.

In addition, an island in the periphery to the temporal side extended from above the horizontal meridian well down to the periphery below (fig. 1). There was a low-grade compound myopic astigmatism with a corrected distance vision of 20/20 in the right eye and 20/40 in the left. At near, J1 was obtained in the right eye and J8 in the left.

Laboratory. There was local reaction to intradermal Mantoux and brucellosis tests. The temperature was 99.4°F. at the time these tests were made and also at the time of the reading 48 hours later. Serologic tests for brucellosis gave mildly positive results. Reaction to the blood Kahn test was negative.

Operation. With bedrest and the use of a binocular bandage, the retina was flattened slightly. A reattachment operation was performed under local anesthesia five days after the original observation. Following surface coagulation by means of the ball electrode with a light browning of the sclera, a long Pischel electrode was used in the area with multiple punctures going well up above the upper level of the mesial and the lateral rectus muscles.

Owing to the positive reaction to the Mantoux test, dihydrostreptomycin was given in 0.5-gm. doses twice daily for two weeks postoperatively. The patient was dismissed from the hospital on the 18th postoperative day, wearing pinhole glasses.



Figs. 1 to 4 (Forbes). (1) Peripheral fields on February 16, 1949; (2) May 4, 1949; (3) May 24, 1949; (4) June 21, 1949. (Red and white, 5/330.)

Rutin and ascorbic acid (rutorbin) therapy was prescribed for home use.

Course. On the 23rd postoperative day, when the sutures were removed, the retina was completely reattached. Two weeks later, on March 30th, the uncorrected distance vision was 20/40 minus in the left eye, and one week later 20/30 minus, uncorrected. The vitreous structure was fairly good. There were few opacities and no bleeding.

On May 4th, the uncorrected distance vision was 20/20 in this eye (fig. 2). At this time the blindspot was slightly enlarged both vertically and horizontally, being 10 by 10 degrees. The peripheral field is shown in Figure 2. On May 10th, the patient was advised to return to work, but to avoid lifting or straining and to continue wearing the pinhole glasses.

When he returned on May 24th, there was detachment of the whole upper portion of the retina in the left eye with a considerable number of vitreous floaters. The lower part of the retina, however, was firmly attached. The tension in the eye was 22 mm. Hg (Schiøtz). The fields showed a complete lower defect (fig. 3).

Aureomycin (250 mg., five times daily) was prescribed, and he was told to continue the use of the pinhole glasses. He was again advised against any heavy lifting or straining, and it was suggested that he live quietly, but bedrest was not ordered.

On June 12th, there was complete reattachment of the retina with an uncorrected distance vision of 20/50 plus, which 15 days previously had been down practically to finger perception. There were some areas above of slight retinal edema. Occasional areas seemed to be elevated as the vessels would, here and there, appear a little darker in these edematous spots. There was great improvement in the vitreous. The opacities had decreased in number, and the structure was about the same as at the time of the original examination.

Ten days later, the uncorrected distance vision was 20/40, and there was a satisfactory field in the eye (fig. 4). The blindspot was 7.5 by 12.5 degrees. Most of the constriction in the field was to the temporal side and above, corresponding to the major portion of the original operative work.

On July 7th, the corrected vision was 20/30, with a tension of 22 mm. Hg (Schiøtz). On July 31st, vision was the same, with the tension dropping to 16 mm. Hg (Schiøtz).

The upper portion of the retina had entirely cleared. The scars of the adhesive chorioretinitis produced by the operative procedure, particularly to the lower nasal and, to a lesser extent, the lower temporal side, were of course present. Corrected vision on August 28th was 20/20, and tension was 26 mm. Hg (Schiøtz).

Outcome. The patient now carries on his regular work with ordinary glasses. When he could no longer be kept under observation by Dr. Solomon and by me, owing to transfer to a newspaper in Louisville, Kentucky, he was referred to Dr. C. Dwight Townes of that city. After examination on April 4, 1950, Dr. Townes reported:

"Visual acuity in the left eye is 20/40. The retina is in situ and the choroidal scars seem firm throughout the lower vault of the fundus. The reduced visual acuity may be due to an old choroiditis in the macular area as there is a scarred area in this region which does not seem to be connected with the operative scars. He consulted me because of discomfort in his work where he comes in contact with naphtha fumes. There was, however, no pathologic condition, and I think the irritation coming from these fumes is not doing any permanent damage."

Discussion

In 1942, Biro[1] described a case of spontaneous reattachment in an elderly patient with massive vitreous bleedings followed by retinal detachment. Two years later, Nelson[2] reported spontaneous reattachment of the retina in an aphakic eye following an attack of acute inflammatory glaucoma.

Also in 1944, Knapp[3] reported 16 cases of spontaneous retinal reattachment with certain consistency of findings: (1) The detachment occurred in younger persons, (2) it was in all of long duration (in other words, old), (3) it occupied the lower half of the eyegrounds and was as a rule flat, (4) its boundary above consisted of white bands,

or streaks of organized exudate with a good deal of black pigment, or both changes.

Some of these conditions are fulfilled in my case. The patient was young. The detachment was, however, not of long duration. The short duration of the pathologic process is attested by the fact that the vision returned to 20/20 following the spontaneous reattachment. It is well known that long-standing retinal detachments always show definite macular deterioration. The detachment was mostly in the lower half of the fundus, but it was not flat, for the most part having an elevation of nine diopters. There was pigment clumping above, but there was no extensive linear marking of organized exudate.

In the right eye, there was evidence in the far periphery of past discrete chorioretinitic process.

Review of the literature reveals no comparable case. There is, of course, a question in this case as to whether or not the underlying cause of the detachment might have been either the brucellosis or tuberculosis infection. The patient received dihydrostreptomycin in adequate dosage for two weeks immediately after the operation. Following detachment of the upper portion of the retina more than three months later, no measures except the administration of aureomycin were taken which might account for the spontaneous reattachment of the retina.

Summary

A case, in a young man, is reported, in which there was detachment of the lower portion of the retina, with multiple holes in the periphery and considerable cystic retinitis in the surrounding area. The retina was successfully reattached with diathermic surgery. There were positive reactions to intradermal Mantoux and brucellosis tests.

A little over three months following the operative procedure, the opposite, that is, the upper, portion of the retina detached completely and suddenly, and a considerable number of vitreous opacities were present. There followed spontaneous reattachment two weeks later with the patient receiving only aureomycin therapy by mouth in the usual manner, 250 mg. five times daily. This eye now has practically as much central vision as the other eye.

409 Citizens Building (2).

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ETHYLENE GLYCOL TOXICITY

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This paper deals with the topical effects of ethylene glycol on the human eye.

Report of Case

History. A 30-year-old white man, a gasoline-station attendant, was seen on October 27, 1949, complaining of poor vision in his left eye. Five days previously, concentrated ethylene glycol that was being poured into a radiator splashed into his left eye. After several days of treatment, the patient was referred by his family doctor because the eye had become progressively worse.

The ocular examination showed: R.E., 20/50; L.E., hand movements. Externally, the left eye showed marked edema of both lids, considerable chemosis and conjunctival injection, palpebral and bulbar. The chamber

was turbid and the iris muddy in color. The pupil was constricted, reacting sluggishly to light and accommodation. Tension was soft to touch.

With the biomicroscope, several small, superficial, pinpoint, staining areas of the cornea were seen. There were numerous dustlike keratic precipitates and many folds in Descemet's membrane. The exudation in the anterior chamber was considerable, the aqueous flare being dense with absence of the usual convection currents. In the flare were numerous cells, many of the pigmented type. The iris architecture was obscured from view.

With atropinization and hot compresses, the eyes became clear in one month. There was no evidence of any permanent defects.

Comment

The label on the ethylene glycol container described the reagent as concentrated, with "no glycerine, ethyl or denatured alcohol, or methanol, wood or synthetic methyl." The United States formulary[1] states that its toxic properties are quite feeble.

According to Hanzlik, Seedenfeld, and Johnson[2] only undiluted ethylene glycol causes chemosis of the rabbit's eye, increased lacrimation and slight swelling of the lower lids. Similar results were reported by von Ooettingen and Jirough.[2] The manual[3] on toxic eye hazards outlines the external effect on the eye as that of "ocular irritation." This case presents an acute iridocyclitis as an additional complicating factor.

1330 Union Street.

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KULVIN-KALT IRIS FORCEPS*

Max M. Kulvin, M.D.
Coral Gables, Florida

In attempting a Stallard iridencleisis, ab externo and with an intact sphincter, insertion of the usual type of iris forceps was found to be difficult because the anterior chamber empties and the iris is pushed up against the cornea. The usual straight forceps would penetrate the iris, while the curved iris forceps would come up against the cornea with the tip.

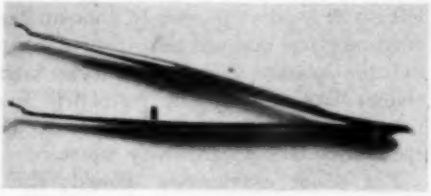

Fig. 1 (Kulvin). The Kulvin-Kalt forceps.

The instrument herein described is based on the exact principle of the Kalt capsule forceps. Since it was devised for the purpose of grasping iris tissue, the cuplike tip of the Kalt forceps was removed and iris teeth were inserted at this point.

This instrument is shaped to take the curve of the cornea and can be inserted under the limbal ring along the under surface of the cornea to grasp the iris without damaging the corneal surface.

It has been found useful in cataract surgery to do both basal and peripheral iridectomy. The blade of the instrument measures nine mm.

* V. Mueller and Company, Chicago, Illinois, manufacture this instrument.

SYMPATHETIC OPHTHALMIA FOLLOWING IRIDOTASIS

Report of a case

Noel T. Simmonds, M.D.
Alexandria, Louisiana

History. W. H. P., a white man, aged 41 years, a clergyman, well developed and nourished, consulted me on September 24, 1948, giving a history of an injury to his left eye about 20 years ago. It had been blind since that time, but caused no trouble until the past week. Since then, it had been painful. The right eye presented no symptoms and vision was normal with glasses.

Examination revealed a normal right eye. The left eye deviated internally about 15 degrees. The cornea was slightly steamy; the anterior chamber of normal depth; the iris, slightly congested. The pupil was about 3.5 mm. in diameter, inactive to direct light, but reacted to consensual light. The lens was opaque. Vision was nil and tension was 55 mm. Hg (Schiøtz).

A tentative diagnosis of old retinal detachment, contusion cataract, and secondary glaucoma was made. Pilocarpine nitrate (2.5 percent) was prescribed together with heat.

He returned again on September 29th, at which time the tension was still 55 mm. Hg, and the pupil still reacted to indirect light. He was instructed to be more regular in use of the drops and so used them for five days more, returning on October 4th, at which time the pupil was 1.5 mm. in diameter and inactive, and the tension was reduced to 35 mm. Hg.

On October 8th tension was still 35 mm. Hg so eserine (0.25 percent) was substituted for the pilocarpine. On October 14th, the tension was 23 mm. Hg; on October 29th, it was 35 mm. Hg. He did not return again until January 24, 1949, at which time the eye was hurting him again. The tension was 60 mm. Hg (Schiøtz) in spite of continued use of miotics. He was anxious to retain the eye if possible, so glaucoma surgery was suggested.

Operation. On January 31, 1949, a combination modified Lagrange sclerectomy and iridotasis of the temporal pillar was done, the iris being completely covered by conjunctiva. Hemorrhage was controlled with heat and air was injected into the anterior chamber and under the conjunctival flap.

Postoperative iridocyclitis persisted in spite of intravenous typhoid vaccine, atropine, and so forth. The last 10 days, he developed increasing photophobia and lacrimation in the good eye, so enucleation and a Cutler implant were recommended. This was done on March 29, 1949.

Three days after the eye was enucleated, he developed a mild iridocyclitis in the other eye. The pupil was dilated readily. Under foreign-protein therapy, atropine, heat, and aureomycin, the iridocyclitis subsided and he left the hospital apparently well on the seventh postoperative day.

After X-ray studies, two teeth which appeared to be infected were extracted. On April 15th, the 17th postoperative day, although the ciliary injection had completely subsided before he left the hospital and the pupil was widely dilated, he was found to have developed a gross descemetitis and slight ciliary injection with an aqueous flare and cells.

Intravenous typhoid vaccine was again given, as was aureomycin. He did not return until April 26th at which time he had more descemetitis, less ciliary injection but a definite optic neuritis. Vision became progressively worse until, on May 21st, it was reduced to counting fingers.

During this time he was seen in the office about every three days, being given large doses of sodium salicylate and intravenous typhoid vaccine in increasing doses, the last dose being 650 million intravenously, the salicylates being left off the day of the typhoid injection and resumed after the fever subsided.

During the first two weeks of June he had to be led to the office and led to a chair. During this time the vitreous was quite

cloudy, although the optic disc could be hazily seen. There was practically no iridocyclitis after the first of May, or one month after enucleation, the main pathologic condition being optic neuritis. The pupil however was kept dilated. Tension was never elevated.

On June 29th, vision was 20/50 and remained so until July 18th at which time it was 20/30. On August 19th, vision was 20/20. It has remained normal and all evidence of the previous inflammation has now subsided with the exception of a few vitreous opacities and a few fine deposits on Descemet's membrane, as seen with the slitlamp. There has been no recurrence.

Comment

This case presented a combination of mild iridocyclitis, which fortunately subsided rapidly, followed by optic neuritis which carries a more favorable prognosis. The disc showed more of edema than inflammation and there was no gross exudate or hemorrhage visible at any time.

It is my opinion that iris occlusion operations should not be done on a blind eye. This experience also makes me doubt the advisability of any intraocular surgery on a blind eye.

Pathologic report

The Army Medical Museum report of the eye is as follows:

AIP Accession no. 262905

Gross. The specimen consists of a slightly soft eye measuring 24 by 23 by 23 mm. The cornea is clear and there is a coloboma of the iris at the 12-o'clock position. The eye is opened in the vertical plane. The vitreous is clear, there is a cone-shaped detachment of the retina and there is thickening of the choroid posteriorly.

Microscopic. The iris is absent beneath the scar of a penetrating wound (operative) of the cornea at the limbus. On this side there is an adhesion between the scar and the lens. The lens is subluxated and its cortical fibers are degenerated.

On the other side there are anterior and posterior synechias, and a thin pupillary membrane. On this side there is marked disturbance of the iris pigment epithelium in the pupillary zone.

In the region of redistributed pigment there is lymphocytic and plasma-cell infiltration, and there also appear to be a few epithelioid cells. Lymphocytes and plasma cells diffusely infiltrate the iris and ciliary body. In addition there are aggregations of lymphocytes sometimes surrounding epithelioid cells which contain pigment granules. The largest collections of epithelioid cells are in the posterior choroid and here eosinophils are also seen. There are a few ill-formed giant cells.

There is bone formation in the choroid adjacent to the disc. The detached retina has lost its rods and cones and ganglion cells, and has undergone gliosis and macrocystoid degeneration. The retina is not involved in the granulomatous process. The optic disc is excavated and the lamina cribrosa depressed.

Diagnoses. Contusion, old; cataract of subluxated lens; old chronic iridocyclitis; secondary glaucoma; scar of iridotasis; sympathetic uveitis.

1404 Murray Street.

SOCIETY PROCEEDINGS

Edited by DONALD J. LYLE, M.D.

NEW ENGLAND OPHTHALMOLOGICAL SOCIETY

November 14, 1950

DR. MILTON F. LITTLE, *presiding*

The 396th meeting of the New England Ophthalmological Society was held at the Massachusetts Eye and Ear Infirmary.

At the afternoon session Dr. David G. Cogan and Dr. David D. Donaldson reported on the experimental production of radiation cataracts. Dr. Thomas Cavanaugh reported a series of 142 cataract extractions in which the erisophake was used, without counterpressure, to deliver the lens by the sliding method; and Dr. Robert R. Trotter reviewed the findings in 21 cases of unilateral exophthalmos.

P_{32} IN OCULAR TISSUES

At the evening meeting, DR. EDWIN B. DUNPHY and DR. BERTRAM SELBERSTONE presented a paper, "Distribution of radioactive phosphorus in ocular tissues."

Four cases of suspected intraocular neoplasm were given intravenous injections of radioactive phosphorus, P_{32}, 48 hours prior to enucleation. Malignant melanoma was subsequently found to be present in two of the eyes; the other two contained no neoplasm.

It was not possible to demonstrate a significant difference between the absorption of P_{32} by the melanomatous tissue and by normal ocular tissue of similar vascular structure. Further work along similar lines is planned.

CLINICAL MEASUREMENTS OF AQUEOUS OUTFLOW

The main topic of the evening, presented by DR. W. MORTON GRANT, is here summarized.

A method has been developed for measuring the facility of outflow of aqueous humor and the net rate of aqueous formation in the intact human eye. This method, which has been termed "tonography," is based upon determination of the rate of change of intraocular pressure and volume in response to certain extraocular pressures. For this purpose, electrical recording over a period of several minutes is utilized in a manner which has previously been described in detail.*

At the time of this progress report, some 800 tonographic recordings had been made on 400 eyes of patients and volunteers. In this accumulated data is contained evidence concerning many previously conjectural aspects of ocular hydrodynamics, particularly in connection with glaucoma.

It was found, in comparing 100 normal eyes with 50 eyes which had untreated glaucoma of all types, that the facility of aqueous outflow was consistently greater in the normal eyes than in the glaucomatous.

In 250 glaucomatous eyes of all sorts, elevation of intraocular pressure was found to be related in all cases to impairment of facility of aqueous outflow (that is, increased resistance to outflow). In no instance was an abnormally high rate of aqueous formation encountered as a cause of glaucoma.

In a correlation of the facility of aqueous outflow and net formation rates with gonioscopic findings, it appeared that in narrow-angle glaucoma an acute attack was associated with marked obstruction to outflow with little alteration of net formation, and that either surgical or miotic resolution of the attack was dependent upon return of facility of outflow to normal.

* Grant, W. M.: Tonographic method for measuring the facility and rate of aqueous flow in human eyes. Arch. Ophth., **44**:204-214, 1950.

Contralateral untreated narrow-angle eyes, which had never suffered an attack of glaucoma, generally had aqueous-outflow characteristics like those of normal eyes. In narrow-angle glaucoma, which had become chronic, reduced facility of outflow was proportional to the persistence of mechanical obstruction of the angle.

In contradistinction to the apparent independence of the outflow characteristics of fellow eyes in individuals with narrow-angle glaucoma, in primary glaucoma of the wide-angle variety the impairment of the facility of aqueous outflow was bilateral in 47 out of 50 cases, although in a number of instances the pressure was definitely elevated only monocularly at the time of first measurement. Glaucoma subsequently became overt in several instances in the contralateral eye which initially had had normal tension but subnormal facility of outflow.

In an additional number of cases where bilaterally subnormal values for facility of outflow were found in eyes which had been suspected clinically of having early wide-angle glaucoma despite normal initial tensions, the presence of glaucoma was subsequently confirmed.

In general, in the treatment of primary glaucoma of either type, reduction of pressure was dependent principally upon improvement in facility of aqueous outflow whether by surgical or miotic means.

In secondary glaucoma elevated intraocular pressure was also related to impaired facility of aqueous outflow rather than increased net formation, but in several cases of this type the facility of outflow was seen eventually to improve and to remain essentially normal without continued treatment.

The experiences with tonography so far indicate that this mode of measurement and calculation not only has considerable potentialities as a method for investigation of glaucoma mechanisms and the influences thereon of drugs and surgery, but that it may also be a useful diagnostic means for identifying early primary wide-angle glaucoma.

Discussion. Dr. David G. Cogan: I think we all have the same feeling—that this is a most important type of practical research which has already indicated and simplified our ideas of the pathogenesis of glaucoma. If I understand Dr. Grant correctly, practically all glaucoma is referable to simply the obstruction of outflow and that he can determine relative grades of susceptibility to glaucoma before a person has it. I judge this is not true of acute glaucoma, from what he said.

I should like to mention a case that impressed me. The other day I saw a man who had no evidence of glaucoma that I could see, except that he had a little constriction of his nasal field. Someone who had seen him in Philadelphia suspected that he had glaucoma. It is possible that the tension has been up in Philadelphia. Anyway, the man was using pilocarpine, but he had absolutely no evidence of glaucoma. His pressure, I think, was in the low twenties, he had no cupping of the disc, and he had never had halos.

Just to be sure, I had Dr. Grant measure his outflow and, sure enough, he had a fairly flat type of curve. Dr. Grant said, "If this man doesn't have a glaucoma, I'm all wrong." We took the man off pilocarpine and, sure enough, he came back after four days with a tension of around 40 mm. Hg.

It has been of inestimable value as an aid in diagnosis and prognosis, too. I know I think it is most impressive.

Dr. Paul A. Chandler: It seemed to me, as I watched Dr. Grant in his work and listened to his presentation tonight, that this must be considered one of the most important contributions to the subject of glaucoma in our time. It opens up a vast new field in the study of the action of the drugs presently at our command and the possibility of discovery of new drugs in the treatment of glaucoma.

As Dr. Cogan has just pointed out, it is

the provocative test to take the place of all provocative tests for wide-angle glaucoma.

I have had occasion, within the past few months, to try to diagnose whether or not a patient did or did not have glaucoma, and have had the experience that Dr. Cogan has just recited.

In some patients in whom the tension was normal, the field was normal and the disc was normal, Dr. Grant has found a marked reduction in the facility of outflow. In such cases I have no hesitation in feeling that the patient does, in fact, have glaucoma.

Dr. Grant has measured other patients who were alleged to have glaucoma and found the tension was in the high twenties, and has also found that the facility of outflow was normal. I feel enough confidence in the test to be able to say to such patients that they probably do not have glaucoma and we need have no further concern about it.

If we do routine tonometry, as many of us do, in patients of middle life and older, we are bound to discover a certain number of patients whose tension is in the high normal range or slightly above normal, and we ask ourselves the question, "Does he have glaucoma or doesn't he?" Dr. Grant can tell you in about 20 minutes whether he has glaucoma or not.

Dr. F. H. Verhoeff: I feel the same as Dr. Cogan, Dr. Chandler, and others who have spoken do about the importance of this work. I think it is intensely important—the best piece of work we have turned out here for years.

But there are certain questions I think Dr. Grant will have to work on. Of course, he'll be delighted to have more things to work on. In the first place, in connection with acute glaucoma, what brings on the acute crisis? Of course, the general idea is that increased secretion starts off the attack. I think he must answer that question.

It is interesting that he found that the main trouble in glaucoma is obstruction of the outflow. Of course, when I had a little paper on the pathogenesis of glaucoma some years ago, based on a study in the laboratory, that is what I concluded that all eyes showed—every eye showed obstruction of the outflow.

In the laboratory you couldn't tell anything about the inflow, of course, but you could tell that the outflow was blocked. I felt that that was the important cause then. But still that question arises about acute glaucoma. You would certainly think that there must be cases in which the glaucoma is precipitated by increased secretion, although no doubt very unusual cases. It seems to me there must be cases of that kind, too.

S. Forrest Martin,
Reporter.

COLLEGE OF PHYSICIANS OF PHILADELPHIA

Section on Ophthalmology

December 21, 1950

Dr. Wilfred Fry, *Chairman*

Variable ophthalmoplegia due to angioneurotic edema

Dr. Wilfred E. Fry and (by invitation) Dr. Nathan Schlezinger presented the case of a 25-year-old woman in whom episodic extraocular muscle pareses, associated at times with palpebral edema, recurred in an irregular and unpredictable manner. Frequent direct observation of this patient extended over a period of about six months with therapy relatively ineffective in controlling the variable ophthalmoplegia.

A survey of the literature indicates that variable ophthalmoplegia is a rare ocular manifestation of angioneurotic edema; although involvement of the nervous system and of the eye otherwise is well recognized. A consideration of differential diagnosis refers to a variety of ailments which may produce variable ophthalmoplegia, such as intracranial aneurysm, ophthalmoplegia migraine, myasthenia gravis, and cyclic oculomotor nerve paralysis.

Discussion. Dr. William E. Krewson, 3rd: Intermittent or variable ophthalmoplegia is quite unusual, and when attributable to angioneurotic edema is very rare. The authors are fortunate to have been able to see such an interesting case, and to have been able to follow it over as long a period as they have indicated.

Angioneurotic edema, as I understand it, is not a clear-cut disease entity, but rather a little-understood symptom complex. It is manifested by an allergic disturbance (not necessarily immediate) in the dermis similar to urticaria, and accompanied by large areas of edema which involve the subcutaneous and deep structures. Often a definite hereditary history of allergy is obtained, and it usually responds, at least to some degree, to adrenalin and antihistamine therapy. I think the case that was presented probably falls within this description, and should be called angioneurotic edema.

The differential diagnosis proposed by the essayists is most complete. I might add the very remote possibility of trichinosis, but they did mention dermatomyositis, the synonym of which is pseudotrichinosis. Beside angioneurotic edema, the most likely possibilities probably are myasthenia gravis, intracranial aneurysm, cyclic ophthalmoplegia, and atypical ophthalmoplegia migraine, and all these apparently have been ruled out.

The diagnosis as to which muscles are involved in cases of multiple oculomotor paralyses can be exceedingly difficult and, when the nature of the paralyses is so transient and rapidly variable, as in this patient, accurate diagnosis is well nigh impossible.

Edema of the meninges has been thought to cause stretching or compression of the cranial nerves as they pass over blood vessels or other anatomic structures within the cranium, but, as the authors have stated, the great and rapid variability of the ophthalmoplegia in this case leads to the conclusion that this disturbance was located peripherally.

Although the neuromuscular mechanism may have been involved directly, it is easy to conceive of the swollen orbital contents interfering mechanically with the action of the muscles, the muscles themselves being compressed, or their integrity actually invaded by edematous fluid.

The lesson, which this beautiful presentation teaches, is that allergy must be added to the ever-increasing list of diagnostic possibilities which are to be considered when we are confronted with a case of oculomotor paralysis.

A FOLLOW-UP REPORT ON EXPOSED IMPLANTS

DR. PATRICK J. KENNEDY AND DR. JAMES S. SHIPMAN: In March, 1949, we reported a series of 45 eyes which had been enucleated or eviscerated. Of these 10 were simple enucleations; in 18 a buried implant was placed in the socket. These are still in place. In 17 an exposed implant was used. Of these, three had been extruded before our original presentation. Since then, three more have been extruded making a total loss of six or 36 percent.

Since 1949, 10 exposed implants have been used. Four of these extruded in a 3- to 15-month period, making a loss of 40 percent. Thus, of a total of 27 exposed implants, 10 have extruded, making a total of 37 percent.

These patients had excellent primary results. After a few months, a thick, viscid, mucoid secretion began coming from the socket. This was usually preceded by a partial exposure of the implant. This secretion was frequently accompanied by a foul odor. Neither the secretion nor the odor responded very well to antiseptic and antibiotic therapy.

We feel the tantalum mesh, while serving as the anchor for the tissues on the implant, is the site of this secondary infection which is so hard to eradicate.

The incidence of extrusion—practically one out of three—is so high that we do not feel that we are justified in continuing the use of the exposed implant until we have a

better method of controlling the secondary infection which apparently plays such a large part in initiating the extrusion.

Discussion. Dr. James S. Shipman: Two years ago when Dr. Kennedy's interest became so manifest in the subject of implants, I gave him permission to take over all of the enucleations on our service at the Wills Hospital, and to do the operation that he thought was best, and he has had a fair opportunity to do a good many enucleations and try out the various types of implants.

Fortunately, or unfortunately, in recent years, due to his good surgery, or our good fortune, we have not had enough enucleations on the service to really build up our statistics. As a matter of fact, the few statistics that we have seem to show as good results as the early statistics. I think that eventually Dr. Kennedy is going to work out something that will be a great improvement over any of the present implants.

As I stated almost two years ago, when he presented this subject the first time, I felt about this subject as one of our patients did. This patient came in with an eye full of mucus and smelling bad, saying, "Doctor, this thing stinks." I thought it then, and I still think that most of them do.

I think the theory of exposed implants is wrong; that it will not work out in practice. I feel that the implant must be covered or buried really to stay in and give the motion that it should. Certainly, in theory, one should get more motion from an exposed implant which is directly connected to the prosthesis, but I do not believe that, in years to come, many of these implants will remain in place. The few that I have done myself have been very unsatisfactory and have caused me a great deal of concern.

I feel that the Dimitry implant in the scleral cup is the ideal operation for enucleation, if and when it is not contraindicated by such conditions as tumor of the globe or orbit or virulent infection. I have a few cases of 15 or 20 years' duration, which have a movable socket with a shell prosthesis lying right over a gold sphere in the scleral cup. I am sorry I do not have a movie to show the motion of some of these prostheses.

I can remember one case in particular in which the gold sphere has been in for 21 years. It is as nice a result as I have ever seen. I think one would logically expect to get better motion when the muscles are not disturbed.

Dr. Kennedy, at a meeting of this section, pointed out that an implant which was flatter anteroposteriorly and wider in the lateral diameter offered a better chance for getting free motion of the prosthesis. He and I have talked about this, and he is going to develop an implant to go inside the scleral cup somewhat on the order of the Allen implant, and shaped very much like a curling ball.

The only thing I do not like about the Allen implant is the cutting of the muscles, and bringing them forward through a ring, and suturing them. It is only natural that they will gradually slough off and be lost; and the implant will turn to one side or the other.

I think the final solution to this problem is going to be an implant similar to the Allen implant, but buried in the scleral cup, completely covered, possibly with some type of a magnet in the center of it. Call it a modification of the Allen and Trautman and Kennedy implants, if you will, but I think eventually something of that nature will be worked out. Certainly, at present we do not seem to have the answer, but give Dr. Kennedy another two years and I think he will have it.

Causes of failure in retinal detachment surgery

Dr. P. Robb McDonald made an analysis of 88 patients with retinal detachments operated upon by him among whom there were 24 failures. An attempt was made to classify failures as occurring in the preoperative

period, operative period, and postoperative period.

The most important factor would appear to be finding the break in the retina. Breaks were found in 86 percent of the successful cases and 33 percent of the unsuccessful cases.

Other causes of failure were: two patients with breaks involving more than one quadrant of the retina, seven with retinal folds and vitreous contraction, three with intraocular foreign bodies, two myopes of −20D. or greater, one case of active uveitis, and one patient with a metastatic carcinoma of the choroid.

Operative causes of failure were listed as failure to close the break, insufficient diathermy, excessive diathermy, insufficient drainage of subretinal fluid, and hemorrhage.

Postoperative causes of failure were listed as iridocyclitis, hemorrhage, and contracture of the vitreous.

In considering failures probably more than one factor plays a part. Certain factors, such as vitreous contracture or separation of the vitreous, are beyond the control of the ophthalmologist, but the failures will be appreciably reduced if the ophthalmologist is willing to spend the time in a careful preoperative examination and meticulous ophthalmoscopic observation during the operative procedure.

Discussion. Dr. James S. Shipman: Dr. McDonald has given us something to think about and, as you all know, we often derive a great deal more good from discussing our failures than we do from presenting our successes. I think Dr. McDonald has presented this picture very well, very concisely, and has pointed out to us why we have failed, when many times we wondered.

As he stated in opening his paper, retinal detachment surgery certainly tests the perseverance, the skill, and the ingenuity of the surgeon.

There are not many points in Dr. McDonald's paper with which I can disagree. There are some I would like to emphasize. First of all, he mentioned one of the reasons for the increased number of retinal detachment cases to be the increased longevity of the patients that we are seeing. I think that is true, but I also think there is another important reason—the general doctor today is more retinal-detachment minded and has come to know that there is something to do for retinal detachments. Many years ago he did not know this. Today he sends these patients to eye centers or to ophthalmologists who are doing retinal-detachment surgery. Nowadays, even the general practitioner reads *Life*, and he learns something about retinal detachment, so that he is on the lookout for the symptoms.

Dr. McDonald has divided the reasons for failure into three classifications: (1) Failure to recognize the condition in preoperative study; (2) accidents at the time of the operation; (3) things that happen after the operation. This is a very good classification, but I should like to add a fourth reason—failures for which we cannot account. The results in some patients simply are not good even though everything seems to indicate that they should be.

As to the preoperative study and our failures there, I think Dr. McDonald has covered it very well. He brought out the most important point, one which has been emphasized by many men—that the cause of retinal detachment is a tear in the retina and the only way to cure the detachment is to seal off this tear. Indeed, careful preoperative study, with a diligent search for the tear in the retina, is one of the most important factors in successful retinal detachment surgery.

I do not entirely agree that Scheppen's method of indirect ophthalmoscopy offers a great deal more than careful direct ophthalmoscopy. In fact, when I think of the two, the latter method seems much more important. Certainly, fixed folds of the retina, as emphasized by Scheppens, always suggest a poor prognosis, as does a failure

of the retina to settle back near its proper position after the patient has been put to bed in a favorable position to encourage this.

Arruga has pointed out that large tears which allow the vitreous to come in contact with the choroid for any length of time always offer a poor prognosis, since the choroid becomes atrophic and cannot be coagulated easily. In these cases the coagulation has to be placed much further back than one would think.

I was glad to hear of Dr. McDonald's results in aphakia, which closely parallel mine. I still feel that aphakia alone, in otherwise healthy eyes, does not offer a great deal worse prognosis than phakic eyes, provided a secondary capsule does not interfere with a good view of the fundus. I think that the chief reason for poor results in aphakia are due to the loss of an unusual amount of vitreous at the time of cataract surgery, or to postoperative hemorrhage with subsequent organization and contraction, or possibly a low-grade endophthalmitis. Barring these three complications, I think aphakia certainly offers a 50-percent favorable prognosis.

Another reason for poor central vision following retinal detachment surgery is involvement of the macula by the detachment. However, children and young adults seem to tolerate such a detachment for a longer period of time than older adults and the aged do. Reese has pointed out a type of cystic degeneration which frequently follows detachment involving the macular region.

Too much diathermy is very likely to give rise to a virulent postoperative iridocyclitis with hemorrhage in the anterior chamber, and sometimes massive vitreous hemorrhage with extensive organization and contraction in the vitreous. Also, a posterior cortical type of cataract consisting of many bubbles suggesting soap suds, may be present. I have seen this in at least 25 cases in young adults with no such opacities in the unoperated eye.

Finally, another reason for some of our failures is the fact that the patient is allowed too many liberties too early. Anyone doing retinal detachment surgery should have a definite routine and this should be followed out religiously for a considerable length of time after the patient has left the hospital.

I can think of many more reasons for failures than Dr. McDonald has mentioned, possibly because I have had more failures than he has had.

In closing, I want to thank Dr. McDonald for this very interesting and most informative paper. I feel that his results of only 24 failures in 88 cases are certainly better than the average. This is particularly so in view of the type of cases which he has done. Many of them, I happened to know, were cases that most ophthalmologists would have turned down, thinking them to be more or less hopeless.

Dr. Edmund B. Spaeth: Failures in retinal separation are not the same as are failures in other surgical procedures in which the manual dexterity of the operator and completeness with which the procedure is carried out are so important. There are so many other factors responsible for failures.

As a matter of fact, at a symposium on retinal separation at the International Congress in London this last summer, the consensus was that retinal separation cannot be operated successfully unless one takes into consideration three, and probably four, different and distinct entities, because one technique will only answer one set of conditions.

These techniques are surface diathermy, transscleral diathermy, and scleral resection. As to the fourth, there are definite indications for scleral trephination with chemical cauterization. I feel that each operation has a primary indication. A scleral resection should not be used as a final frenzied procedure after three or four other procedures have been unsuccessful.

There is no doubt that aphakia and the retinal separations of aphakia are connected with uveitis. Attention was called

to a paper presented five years ago before the American Academy of Ophthalmology and Otolaryngology in speaking of the triad of uveitis, cataract, and retinal separation.

It seems that the retinal separation of aphakia may, in addition, be due to an anatomic situation—the lost supporting diaphragm to the vitreous of the suspensory ligament and lens.

There is no doubt that the essentials in preoperative investigations are: retinal holes, the state of the vitreous, and the degree of the myopia. These three conditions are far more important than anything else, excepting of course, traumatic separations which are the result of perforating injuries. The two surgical requirements are closure of all retinal lacerations and arranging for subretinal drainage, for it is the drainage of fluid through the holes that is responsible for the separation. These two surgical requirements must be adjusted to the indications present.

High myopia with detachment does not lend itself to extensive transscleral diathermy. The retinal separation of aphakia in the presence of a fluid vitreous lends itself best to a scleral trephination with chemical cauterizations. Cases with marked vitreous contraction have a very poor prognosis regardless of the technique used.

The retinal separation of retinal and choroidal coloboma should be operated with a scleral resection as a primary procedure. Flat retinal separations are best handled by surface scleral diathermy. Retinal lacerations without separation must be operated and, in these cases, the only point of significance is the closure of the retinal hole. There is no necessity for arranging for subretinal drainage.

There are some of the factors which demand a variety of techniques in retinal separation surgery.

M. Luther Kauffman,
Clerk.

CHICAGO OPHTHALMOLOGICAL SOCIETY

November 20, 1950

Dr. J. Robert Fitzgerald, *President*

(The clinical meeting was presented by the Departments of Ophthalmology, Michael Reese and Mt. Sinai Hospitals.)

Von Hippel-Lindau's disease

Dr. E. Kamellin presented a 45-year-old white man, who came to Michael Reese Hospital on July 20, 1950, because of dysphagia, numbness, and tingling of the right leg of two months' duration. There were no visual complaints in the right eye at that time.

He had a past history of progressive painless dimness of the left eye which gradually became totally blind 15 years ago. The left eye was removed 14 years ago and replaced by a prosthesis. No pathologic description of the left eye was obtainable.

Two months ago he noted a peculiar numbness and tingling sensation of the right foot which gradually spread to the thigh. There was no anesthesia, paralysis, or hyperesthesia. He had some difficulty in walking and unsteadiness of gait.

He also had some difficulty in swallowing, but no pain. The speech had become slurred and he had protracted attacks of hiccoughs two months ago, not recently.

A sister had died two years ago, aged 44 years, of Lindau's disease; she had been blind since the age of 19 years. The father was blind at the time of his death, of unknown cause.

The only significant findings on examination were neurologic. Deep tendon reflexes were exaggerated particularly on the right. He had nystagmoid movements on extreme right lateral gaze; decreased vibratory sensation of the right lower extremity; posterior column disturbances on the right side.

The laboratory findings showed: Serum

amylase, 105 mg.; blood Wassermann, negative; spinal fluid, 4-plus (Pandy), colloidal curve, normal. Blood count was normal.

X-ray studies of the skull showed prominent vascular markings; no evidence of bone erosion; normal sella turcica; calcification of the pineal gland and slight decalcification of the posterior clinoids. There was no evidence of intracranial hemangioma. Treatment consisted of atropine and phenobarbital.

The disease was described in 1879 by Panas and Reney, but Lindau was the first to make it known as a concept of general systemic disease in 1926. Von Hippel, in 1904, described two cases from the clinical viewpoint.

According to Lindau, tumors were found in the retina, medulla, cord, pancreas, liver, adrenal, kidneys, epididymis, and ovaries. Von Hippel found that 20 percent of retinal cases have intracranial complications, bilateral in 36 percent. The disease occurs in the third decade of life, and there is a familial or hereditary incidence.

The clinical findings are: (1) Vascular dilatation and angiomatosis formation, followed by the appearance of hemorrhages and exudate; (2) the stage of massive exudation and retinal detachment; (3) finally glaucoma and destruction of the eye.

Bockhoven and Levatin in 1947, in operating on a cord tumor, found numerous dilated vessels on the cord; the patient had the usual symptoms of hyperesthesia and increased tendon reflexes. After the operation, examination of the eye showed a similar angioma.

Roentgen treatments were not successful, a Weve diathermy puncture was tried; the angioma was much smaller in size, and they thought that, in this instance, the treatment was successful. Guyton and McGovern tried X-ray radiation up to 1,500 r on angiomas with no results.

There has been some debate as to whether these lesions should be called hemangiomas or hemangioblastomas, the differentiation being that the hemangioma is more cellular. It has been suggested that, in all tumors of the spinal cord when hyperesthesia is present, the fundi be examined to rule out Lindau's disease.

Discussion. Dr. Milton Scheffler said that, in the case shown tonight, the picture of the blood vessels was not typical of angiomatosis. There was only slight dilatation of the artery and vein with raspberry tumors in the periphery, small and quite localized. The neurologists feel there may be an angiomatous tumor in the posterior fossa.

Whether or not surgery will be carried out has not been decided. From the standpoint of the eye, it will be kept under observation. The central nervous-system lesion is certainly the more important.

Possible toxoplasmosis

Dr. Samuel Kaufman said that, when this patient was first seen, he had a total cataract in the left eye. The lens in the right eye was sufficiently opacified so that little of the fundus could be seen. Following extraction of the lens in each eye, it was evident that there was an extensive chorioretinitis present, with involvement of both macular areas. It was thought that this might be congenital in origin, as the patient had noticeable microphthalmia in the right eye; there were some vascular remnants in the pupillary area.

Congenital toxoplasmosis has three outstanding symptoms: (1) Because of the special predilection of toxoplasma for the central nervous system, convulsions are usual; (2) because of the nature of the pathologic tissue, X rays will show intracerebral calcification in most cases; (3) the retina shares in the pathologic condition of the brain and there is therefore a chorioretinitis. None of these three symptoms are considered pathognomonic.

Convulsions occur in many childhood diseases, and calcium deposits are found in other diseases; chorioretinitis of toxoplasmic origin is not pathognomonic. When

the three symptoms occur together, however, they are pathognomonic of congenital toxoplasmosis.

In the present case, X-ray studies have shown calcification, but in an area considered to be physiologic, in the choroid plexus of the posterior horn and lateral ventricle. There is not a sharp demarcation of the lesions and the retina between the lesions is also more or less involved.

The data, therefore, are not sufficiently clear-cut for a positive diagnosis of toxoplasmosis. It may be an inflammatory process of congenital origin due to some factor other than toxoplasmosis; or it may be due to a developmental anomaly.

Foster-Kennedy syndrome

Dr. M. Pearlman presented a 39-year-old white woman, whose history is interesting. Beginning four years ago she had a vaginal discharge which was untreated. In 1947, she noted what she called "lacy vision" in both eyes. In 1948, she stated that she completely lost the vision in the left eye for a period of nine hours. At that time she was hospitalized and studied and a diagnosis of retrobulbar neuritis, based on multiple sclerosis, was made; the details of the findings at that time are not available.

Three years after the original complaint, the vaginal discharge became bloody in character, and at that time it was found that she was losing weight. Because of nervousness she voluntarily entered Elgin State Hospital, where examination revealed a carcinoma of the uterus. A panhysterectomy was performed in January, 1950.

Vision at that time in the right eye was somewhat faulty, with "lacy" vision; that in the left eye was markedly reduced. When examined at Research Hospital some months later, the right eye showed: vision, 20/40; tension, normal; media, clear; the optic disc showed blurring of the disc margins, erasure of the cup, and questionable elevation of the disc. In the L.E., vision was finger counting; tension, normal; media, clear; the disc was chalky with sharp outlines.

On the basis of these findings the patient was referred to the Department of Neurology where a complete analysis of the case revealed that the skull plates were free of any pathologic process; interarteriograms were negative; orbital films were normal; lumbar puncture was normal. The optic fields showed enlargement of the blindspot with normal peripheral isopters in the right eye; the left eye showed great reduction in fields to above five degrees on the temporal side.

The case is presented for suggestions as to further diagnostic procedures. Visual field studies will be repeated as the present ones are felt to be inaccurate. The possibility of aneurysm has been eliminated through laboratory procedures; there is no evidence of arachnoiditis; no evidence of sphenoidal ridge tumor or of involvement of the optic foramen. There is the possibility of metastatic involvement in some prechiasmal area, from the lesion in the uterus; or of bilateral retrobulbar neuritis.

Richard C. Gamble,
Secretary.

AMERICAN JOURNAL OF OPHTHALMOLOGY

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FIFTY-SIXTH ANNUAL SESSION OF THE ACADEMY

The 1951 annual meeting of the American Academy of Ophthalmology and Otolaryngology in Chicago, from October 14th to October 19th, exceeded in attendance all other previous meetings. More than 5,400 members and guests were registered. The already overcrowded facilities were stretched to the bursting point in spots. The catering department of the Palmer House did a miraculous job of satisfying the inner man, and the annual confusion of rooms was reduced to a minimum due to careful preconvention planning.

Most of us accept the smooth housekeeping workings of this mammoth society as a matter of course, but those behind the scenes appreciate the magnitude and the efficiency with which our secretary, William L. Benedict, and the hotel management coöperate in putting this super medical meeting over so well.

The ophthalmic section meetings were, in the opinion of most of the members, the most successful ever held. The splendid ad-

dress of Count Hermenegildo Arruga of Barcelona, Spain, the guest of honor, was enthusiastically received by the members of the section and our gracious guest endeared himself to all by his modesty and high human qualities, as well as impressing us with his great intellectual integrity. His lecture, "Consideration on surgical treatment of retinal detachment," summarized his 20 years' work in this field. By the recitation of his vast experience, the members gained an insight into the problems pertaining to this subject that will be of immeasurable benefit to our patients, a point which the vice-president, Peter Kronfeld, thoughtfully brought out in introducing Arruga.

The president, Derrick Vail, in his address discussed phases of military ophthalmology and measures by which the academy could be of help to the government authorities, the military, civilian defense, and to the members of the academy called to active service in the Armed Forces.

Shields Warren, of Boston, gave a splendid and instructive address on "The pathologic pattern of atomic injuries"; Champ Lyons of Birmingham, Alabama, disclosed problems of "Isotopes in medicine." These two addresses of our special guests were followed by a motion picture on the atom bomb that was literally stunning.

The symposium on "Retinal detachment," under the direction and chairmanship of Lawrence T. Post, was one of the high spots of the meeting. The large ballroom of the Palmer House was sardine-packed with members and guests, many of whom stood patiently throughout the three hours of the symposium. A greater tribute to the effectiveness and interest of the presentation is not possible.

Joseph A. C. Wadsworth, of New York, spoke on the "Etiology and pathology," showing numerous beautiful pathologic specimens. Charles L. Schepens, of Boston, discussed the "Diagnostic and prognostic factors as found in preoperative examination," emphasizing the importance of a careful study of the affected eye particularly in the zone of the ora serrata.

Dohrmann K. Pischel, of San Francisco, described "Typical procedures and the localization of breaks." His exposition, based on many years of special work and study, was most authoritative and valuable. Peter C. Kronfeld, of Chicago, described most effectively the "Postoperative care and complications, including reasons for success and failure, and the fundus picture of postoperative cases."

A careful summary and evaluation of results then followed, given by William F. Hughes, Jr., of Chicago. The over-all figure of 67-percent successes obtained by an analysis of the cases operated upon by the members of the panel was most interesting since it agrees so closely with the figures obtained by other American surgeons and reported in the literature several years ago.

The symposium closed with a short period of questions and answers. The precision of its presentation attests many hours of hard work in coördination and rehearsals and was rewarded by the prolonged and enthusiastic applause from the audience at its close.

There were remarkably few weaks spots in the scientific program and the strength of most of the papers and the other symposia made an extraordinarily eventful session. These were the symposium on "Microwave diathermy in ophthalmology," by H. E. Thorpe and W. B. Clarke; the symposium on "Ocular manifestations of dermatological diseases," by Phillips Thygeson, Isadore Givner, and Frank Allende; the symposium on "Orbital implants after enucleation," by A. D. Ruedemann, A. M. Culler, J. S. Guyton, William Stone, Jr., N. L. Cutler, and R. C. Troutman.

The Jackson Memorial Lecture on "Ocular wound healing," by John H. Dunnington, a particularly noteworthy discussion of fundamental facts based on animal experimentation, was of much value to the clini-

cian. The exceedingly important paper on "Clinical tonography," by W. Morton Grant, showed that the method of measuring the rate of outflow of aqueous described by him at the Section on Ophthalmology of the A.M.A. in June, 1951, could be easily and effectively utilized in office practice by the use of the conversion tables devised from his long, accurate scientific studies of the problem. He gracefully paid tribute to Peter Kronfeld for the latter's pioneer studies on this subject 17 years ago.

As has now become customary, each meeting was opened with an interesting and informative clinicopathologic case report given by various members. This year's crop was extra good. Five scientific motion pictures, mainly surgical, were shown, besides the fine ones shown by Arruga. The hit of the films was the one by Prof. Dr. Marc Amsler of Zurich, who could not be present himself for the showing, on "The anterior-chamber puncture." This is truly a most extraordinary motion picture and one never tires of seeing it.

There were 22 scientific exhibits of which 11 were on ophthalmic subjects. Of these, the first ribbon was awarded to Algernon B. Reese and his co-exhibitors, F. C. Blodi and J. C. Locke, for their superb exhibit on "Retrolental fibroplasia"; the second, to Phillips Thygeson and his co-exhibitors, Isadore Givner and Frank Allende, for their detailed and instructive exhibit on "Dermatologic diseases of ophthalmologic importance"; the third, to Helenor Campbell Wilder on "Malignant melanoma of the choroid and ciliary body."

In the Section on Instruction, there were 41 continuous courses and 115 individual courses given, covering nearly every field in ophthalmology. One of the popular features were the Home Study Courses discussion periods of which there were 10 in ophthalmology. A special program of motion pictures on the "Anatomy of the orbit," by W. H. Hollingshead, and on "Glaucoma," sponsored by the National Society for the Prevention of Blindness, was given during one of the evenings.

It is apparent that every minute of the day and part of the night for the duration of the meeting was fully organized. The social events included the alumni dinners, some 45 in number; the smoker, crowded as usual; and the official banquet at which Victor Johnson, M.D., director and professor of physiology, Mayo Foundation, gave an illuminating address on "Problems in graduate medical education."

Besides these events, there were other dinners and functions, such as the initiation of a new society, the Society of Military Ophthalmology; the Pan-American dinner; and the banquet given by the American Society of Ophthalmologic and Otolaryngologic Allergy. There were also daily cocktail parties, private functions and reunions of old friends.

The election of 382 new members brought the total membership of the society to more than 5,000; 24 Honor Keys were awarded; and Gertrude Rand-Ferree, Paul Boeder, and Count Arruga were elected Honorary Fellows in the society.

After 10 years as a most efficient secretary for the Section on Ophthalmology, A. B. Reese resigned with expressions of much regret by the members, and was replaced by Kenneth L. Roper of Chicago. James Milton Robb of Detroit was elected president; Frederick C. Cordes of San Francisco, the president elect; Georgiana Dvorak Theobald, Oak Park, Illinois, first vice-president; Percy E. Ireland of Toronto, second vice-president; and John S. McGavic of Bryn Mawr, Pennsylvania, third vice-president.

The meeting of the last day was saddened by the news of the death in Denver of William H. Crisp, a devoted member of the organization and consulting editor of the JOURNAL.

The next meeting will be at the Palmer House, Chicago, October 12-17, 1952.

Derrick Vail.

On September 4, 1951, the president of the International Council of Ophthalmology, Sir Stewart Duke-Elder, presented the check for £574, the contribution made by American ophthalmologists toward the restoration fund of Saint James's Church, Piccadilly, to the Venerable C. E. Lambert, Archdeacon of Hampstead and Rector of Saint James's Church, Piccadilly, whose letter of gratitude appeared in the October, 1951, issue of the AMERICAN JOURNAL OF OPHTHALMOLOGY.

MEDICAL OPHTHALMOLOGY

A study of the results of examinations conducted by the American Board of Ophthalmology affords an opportunity to determine where deficiencies exist in the training of young ophthalmologists.

It has been the impression of many that the greatest number of failures in the written qualifying test occurs in the subjects of biochemistry and visual physiology. A recent survey of the marks given during the past three years shows that this is not the case. The candidates are becoming fairly well grounded in these basic subjects, due probably to increased emphasis placed on them in the various postgraduate courses. The same is true of optics and neuro-ophthalmology which used to rank well up on the failure list. The casualty rate in pathology is still rather high. What is most surprising, however, is the status of medical ophthalmology which enjoys the dubious distinction of holding first place in total number of conditions for each of the past three years!

One might understand the failures in certain basic subjects. Important as they are, the average ophthalmologist tends to disregard them in his busy life of taking care of patients. But the relation of the eye to general disease is something he cannot afford to neglect. He is faced with it constantly and to be a good clinician he must give up the idea that he is just an eye specialist and realize he is primarily a physician.

It is possible that in our zeal to turn out well-rounded ophthalmologists with a firm

background of basic science, we may not have sufficiently emphasized the very simple fact that the eye is only a part of the body and, as such, is closely associated with many general diseases.

All residencies and postgraduate courses should re-evaluate their teaching programs and make sure that proper weight is attached to medical ophthalmology.

Edwin B. Dunphy.

CORRESPONDENCE

Geometry of visual space

Editor,
American Journal of Ophthalmology:

I am able to corroborate the remarkable effect produced by the designs described by Marion Stoll (Am. J. Ophth., **33**: 1919, 1950), but there is no need to invoke the aid of higher mathematics or psychophysics to explain the phenomenon. The method of construction of the cards and the way they are viewed through red and green glasses so that the lines seen by each eye converge on a point directly below them suggest a much simpler explanation.

Consider the card horizontally placed and the eyes viewing it as shown in the diagram (fig. 1). A projection of the lines, seen by each eye in turn, can be made from the corresponding eye onto various planes beyond the card.

As the plane is rotated downward, the lines projected on it will show a decreasing amount of convergence from A-B until the plane is vertical, on which plane (ABCD) the projected lines would be parallel, beyond which (ABEF) the lines would diverge from A-B.

Clearly fusion of the images seen by both eyes can only be obtained by mentally projecting them onto the vertical plane. The effectiveness of the result shows how strong is the desire for fusion.

To avoid confusion in the diagram only a few projection lines are shown. An essentially similar explanation holds for the cards whereon the lines are drawn from a Vieth Müller circle except that fusion is obtained on the inside of a vertical cylinder or cone.

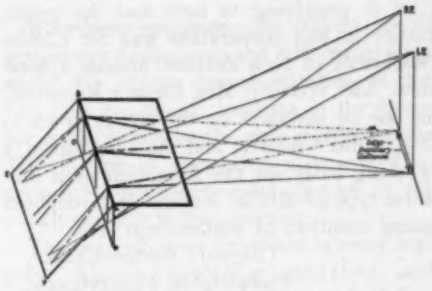

Fig. 1 (Primrose). Diagram showing placement of card.

The converse can be easily demonstrated by looking at vertical lines through a horizontal glass plate and tracing on the glass the appearance of the lines as seen by each eye separately. The design traced on the glass will be found to correspond with the design of Stoll's cards.

(Signed) John Primrose,
Glasgow, Scotland.

Raised type for blind

Editor,
American Journal of Ophthalmology:

In my article, "Raised-type books for the blind: A brief review of their printing," which appeared in the July, 1951, number of the Journal, the devout wish is expressed that uniformity of type might be accomplished. I have this encouraging statement to make.

In order that embossed types for the blind might easily be read by all the nations severally, a convention of delegates from a number of southeastern nations, under the direction of UNESCO, was held at Beirut, for the purpose of agreeing on a simple form of Braille which would be adopted by all the nations. This meeting was held in February, 1951.

It is gratifying to note that the prime mover in this coöperation was Sir Clutha Mackenzie of New Zealand, himself a blind man. And, recently, Mrs. Eleanor Roosevelt, in one of her days on the air, referred to Sir Clutha's interest and the adoption of a working basis for the formation of a uniform type of Braille serviceable throughout many countries of southeastern Asia.

(Signed) Burton Chance,
Philadelphia, Pennsylvania.

BOOK REVIEWS

MANUEL D'OPHTALMOLOGIE. By P. Bailliart and A. Magitot. Paris, G. Doin & Cie and Masson & Cie, 1950. 1,154 pages, 602 illustrations, index. Price: Not listed.

The authors of this excellent textbook of ophthalmology are two of the most distinguished of French ophthalmologists. They have eminently succeeded in preparing an excellent volume designed for medical students, young physicians, and the general practitioner. There is a wealth of material that should interest the expert ophthalmologist as well.

Those who read French will relish the fluency and eloquence of the authors' way of expressing themselves. For example—"While the patient, seated before us, tells us the object of his visit, we observe him; immediately we are aware of the way in which he presents himself to us; with an equal reduction of vision, two patients have an entirely different attitude: one in whom the lens is beginning to become opaque fears the strong light which shuts down his pupil; he half closes his lids, lowers his head, or makes a screen with his hand above his brow, keeps his eyes in the shade; the other, in whom the ocular fundus is diseased, on the contrary, often opens widely his eyes and looks for the light which the other has shunned."

The book is divided into four sections: (a) General matters in examination and techniques; (b) congenital anomalies and diseases of the eye, adnexa, optic nerves, retina, choroid, ocular motility, and ophthalmo-neurology; (c) techniques of ocular surgery; and (d) refractive errors. It is very up to date and designed on a grand scale. The illustrations are exceedingly good.

Derrick Vail.

OPHTHALMIC DISPENSING. By Russell L. Stimson. Saint Louis, Missouri, C. V. Mosby Company, 1951. 418 pages, 178 illustrations. Price: $8.00.

Ophthalmic Dispensing could not have been written by a person having had dispensing experience alone. One seems to sense that the author has had experience as a teacher and student of ophthalmic optics and refraction as well. This book would excellently serve as an appendix to any modern book on refraction. In fact, it should be recommended to all residents in ophthalmology as a "second volume" to any text on refraction now being used.

The arrangement of the text is original, fresh, and well organized. Almost any chapter can be read independently without reference to much that has preceded it. In that sense it should serve as a ready reference or handbook on refraction and dispensing problems.

"Intra-office dispensing" is growing in some of our larger cities. This book comes at the psychological moment when office assistants are being considered for these new duties. No other text could better serve as the basis for training assistants.

The section dealing with bifocals is outstanding. Always a troublesome problem, presbyopic prescription analysis is thoroughly and intelligently discussed. This chapter is of great interest and importance to every refractionist.

The reviewer is somewhat concerned that, because of its title, this important book may receive inadequate distribution. It would be

wrong to assume that it is intended only for those interested in the dispensing of spectacles. The title most applicable to this work and which would describe its broader scope, although much too long, is "Fundamentals in the art and science of prescribing and fitting ophthalmic physiotherapeutic devices."

J. C. Copeland.

BULLETIN OF THE BELGIAN OPHTHALMOLOGICAL SOCIETY. 1950, pages 1-526.

Congenital glaucoma was the main topic at the February session.

Jean Kluyskens divides the disease into several categories.

The complete form is a malignant form and starts soon after birth. Its most characteristic signs are an increased corneal diameter, a very deep anterior chamber, and the persistence of mesodermal embryonic tissue in the depth of the chamber angle with displacement or underdevelopment of Schlemm's canal. The increased ocular tension causes edema during the acute stage and, later on, ruptures in Descemet's membrane, iris atrophy, ectasia of the limbal region, glaucomatous cupping, and progressive loss of vision.

The incomplete or benign form might often be mistaken for megalocornea. The ocular tension is not increased and the function of the eye remains good except when it changes to the complete glaucoma in later life. Those cases show anomalies in the chamber angle in contradistinction to the simple megalocornea with normal chamber angle and a normal canal of Schlemm. The infantile glaucoma has no relation to a congenital anomaly and is best defined as acute or chronic glaucoma in a child or adolescent.

The last group includes secondary glaucomas, following uveitis or congenital anomalies such as aniridia, microphthalmos, or subluxation of the lens. A secondary glaucoma also might occur in neurofibromatosis and angiomatosis.

Kluyskens emphasizes the importance of gonioscopy in diagnosis and differential diagnosis. He draws special attention to the fact that mechanical blocking in the chamber angle cannot be the only reason for the development of congenital glaucoma. Disturbances in neurovascular factors in the uvea contribute to the condition.

The only effective treatment is early surgery. Elliot's trephining operation and iridencleisis are the operations of choice. Perforating and nonperforating diathermy were applied either after the classical operations were unsuccessful or in eyes in which an opening of the eyeball seemed inadvisable. Goniotomies were tried seven times. Dubois and Poulsen had two cases, both of which were unsuccessful. Fieringa had five cases, with good results in four of them. Barkan successfully operated in 66 out of 76 cases. This was cited as very remarkable.

Kluyskens also discusses the operation of Gallenga, which consists in a needling followed by aspiration of the lens, an operation which, as quoted from Lagrange, is not used as much as it should be.

As far as the normalization of the tension is concerned, the operations were successful in 60 percent of the cases. The result in conservation of vision was not so good, as only 23 percent of the patients retained useful vision.

This study was based on 214 cases of congenital glaucoma, 31 of which were personally observed by the author.

Charles Thomas, J. Cordier, and B. Algan discuss cyclodiathermy puncture in infantile glaucoma. L. Weekers and R. Weekers showed a movie on their technique of the nonperforating cyclodiathermy.

M. Potvin and L. Weekers and R. Weekers report two separate papers on the pathogenesis of buphthalmos. They believe that gonioscopic examination and study of the aqueous veins make it quite clear that vascular anomalies in the uvea are just as important in the pathogenesis of the hyper-

tension as the existence of embryonic tissue in the chamber angle. They prefer iridencleisis to goniotomy in the treatment of their patients.

A paper on facial angiomatosis and glaucoma was read by Hambersin and Bernolet. Appelmans, Michiels, and Forez report on symmetrical malformation of the anterior segment of the eye (Peter's syndrome).

Coppez discusses the trephining operation and advises that one should follow strictly the technique as described originally by Elliot. Zanen reports on his studies to find a method of proving a permanent filtration of a well-executed trephining operation.

Weekers, Heintz, and Prijot studied the aqueous veins in rabbits and guinea pigs and found that the aqueous content depended on the intraocular pressure and that the aqueous disappeared whenever the intraocular pressure fell below 15 mm. Hg, an observation which confirms clinical findings.

In another series of experiments, they destroyed all of the aqueous viens permanently. The exchange of fluorescein between blood and aqueous was increased and the ocular tension decreased after an initial two-hour rise, two facts which were explained by the uveal vasodilation following the surgical trauma.

These observations should serve as proof that the aqueous veins are not the only drainage system of the eye. The fluid transfer through the uveal capillaries is at least as important.

A paper on familial megalocornea was read by Appelmans and J. DeNiel.

At the June meeting, R. Wiball and A. Meunier discussed the pathogenesis and etiology of congenital hereditary nuclear cataract and showed the pedigree of a family of 241, 44 of whose members had a proven cataract of this kind.

R. Weekers presented a new type of adaptometer (type Jayle). G. Kleefeld discussed the micrometry of the fundus with polarized filters. This method has the advantage of giving depth perception and, therefore, gives better clinical information than the simple retinography.

J. François and J. P. Deweer believe in the dissociation of the pathways for visual perception and pupillary reaction in the optic nerve, and they localize the pupillary fibers, in the nasal periphery of the optic nerve at least, in the optic canal. Many case reports of traumatic lesions of the optic canal document the recuperation of vision but with a permanent loss of the direct light reflex of the affected eye and the consensual light reflex of the other eye.

L. Weekers, R. Weekers, and J. Dedoyard consider glaucoma capsulare to be essentially a chronic glaucoma and the exfoliation of the anterior lens capsule and partial obstruction of the trabeculum of minor importance in the etiology of the ocular hypertension.

A. Fritz reported on the rapid rise and fall of tension in the uveal capillaries of glaucomatous eyes and their importance in the intraocular circulation.

L. Alaerts calls attention to the anti-exudative effect of heparin and its possibilities in the treatment of exudative eye diseases under strict control of the intraocular pressure.

L. Coppez and his associates made a detailed study of tissue therapy, following either Filatov's or Renard's technique, in different eye diseases, mostly retinitis pigmentosa and myopia gravis. Among 126 cases, only six showed objective improvement. J. François had no result in eight cases of retinitis pigmentosa which he treated with instillations of the melanophoric hormone of Mussio-Fournier.

Eye lesions in Heerfordt, Mikulicz, Sjøgren, Behçet, and de Bazin's syndromes were summarized by Applemans and his associates under the title of "Atypical tuberculosis of the eye." Streptomycin proved to be ineffective in these diseases.

Alice R. Deutsch.

ABSTRACT DEPARTMENT

EDITED BY DR. F. HERBERT HAESSLER

Abstracts are classified under the divisions listed below. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. Anatomy, embryology, and comparative ophthalmology
2. General pathology, bacteriology, immunology
3. Vegetative physiology, biochemistry, pharmacology, toxicology
4. Physiologic optics, refraction, color vision
5. Diagnosis and therapy
6. Ocular motility
7. Conjunctiva, cornea, sclera
8. Uvea, sympathetic disease, aqueous
9. Glaucoma and ocular tension
10. Crystalline lens
11. Retina and vitreous
12. Optic nerve and chiasm
13. Neuro-ophthalmology
14. Eyeball, orbit, sinuses
15. Eyelids, lacrimal apparatus
16. Tumors
17. Injuries
18. Systemic disease and parasites
19. Congenital deformities, heredity
20. Hygiene, sociology, education, and history

5

DIAGNOSIS AND THERAPY

Pepri, G. **Efficacy of terramycin compared with other antibiotics.** Rassegna ital. d'ottal. **20**:15-28, Jan.-Feb., 1951.

The action of terramycin in 0.5 percent isotonic solution of 0.1-percent ointment was compared with that of aureomycin and chloramphenicol. Epidemic keratoconjunctivitis, herpetic eruptions and some cases of trachoma were treated. In bilateral affections, one eye was treated with terramycin and the other with other antibiotics. The former was no more effective in keratoconjunctivitis or in herpes but cleared acute conjunctival infections and some cases of trachoma somewhat more rapidly. Eugene M. Blake.

Long, P. H. **The antibiotics.** Tr. Am. Acad. Ophth. pp. 524-535, May-June, 1951.

Aureomycin is considered more effective than penicillin in staphylococcal infections, clean surgery and dental extractions. In streptococcal, pneumococcal, neisserian and meningococcal infections penicillin is preferred. Chloramphenicol is the drug of equal choice with aureomycin in streptobacillary and rickettsial infections; in tuberculosis streptomycin with para-amino-salicylic acid is indicated. A specific treatment for herpes was not suggested. Serious toxic reactions rarely follow aureomycin, chloramphenicol and terramycin therapy but loose stools and nausea may occur. (4 tables)

Chas A. Bahn.

Witmer, R. **Additional experiences with para-aminosalizylic acid.** Ophthalmologica **121**:79-85 Feb.-March, 1951.

Witmer has used para-aminosalizylic acid (PAS) extensively in the treatment of tuberculous eye diseases. PAS was given by mouth in daily doses of 12 gm. or by subconjunctival injection of a 2.8 percent aqueous solution. In some of the cases streptomycin and PAS were given together subconjunctivally. The clinical results were on the whole favorable in that the majority of cases showed a demonstrable beneficial effect of the PAS therapy. Acute, exudative manifestations of the disease responded much better than the chronic-cirrhotic forms. Acute flare-ups at the beginning of the PAS therapy were rather common and suggested a mechanism on the order of the Herxheimer reaction. In the discussion Bietti and others recommended frequent pro-

thrombin time determinations during the treatment with PAS so as not to cause new hemorrhages in cases of periphlebitis or other tuberculous vascular diseases. On the basis of his extensive experiences in Davos, Semadeni expressed the view that PAS plus streptomycin had not proved superior to sanitarium treatment in the high Alps. The unsightly brown spots which develop in the conjunctiva after subconjunctival injections of PAS disappear after four to six months and can be prevented altogether by using a new PAS preparation marketed by Sauter in Geneva. According to Goldmann the results of PAS therapy alone or in combination with streptomycin, are, in fresh cases, far superior to any other form of therapy. Thiel stressed the importance of watching the patient's state of allergy and immunity throughout the period of active therapy. He uses a new purified tuberculin (G. T. Hoechst), the sedimentation rate of the red cells and the complement fixation reaction of Herrmann (Klin. Monatsbl. f. Augenh. **115**:624, 1949). In closing the discussion Witmer reported promising results with the agglutinine reaction of Middlebrook and Dubos (Am. Rev. Tuberculosis **62**:223, 1950). This test may prove of great value in the diagnosis and follow-up of ocular tuberculosis.

Peter C. Kronfeld.

Moutinho, H., and Basto, L. **Ocular therapy with cortisone applied locally.** Arch. d'opht. **11**:241-248, 1951.

The authors employed cortisone by instillation and subconjunctival injection in 30 cases of inflammation involving the anterior segment of the eye. Seven cases of allergic conjunctivitis treated by frequent instillations of a cortisone suspension were almost completely relieved. In a single case of phlyctenulosis, healing was complete in six days. Of five cases of scleritis and episcleritis, four showed complete healing, the fifth only an attenuation of the disease. The remaining 16 patients had uveitis of varying types and were treated by instillations and subconjunctival injections. All responded favorably, from attenuation of the inflammatory signs to complete healing. Of special interest were cases of sympathetic ophthalmia and Behcet's syndrome which responded well, and of postoperative uveitis, which responded dramatically. The hormone was well tolerated in all but one case. The theoretical aspects of the collagen diseases and the mode of action of ACTH and cortisone are discussed at length. Phillips Thygeson.

Österlind, Göte. **The value of prophylactic systemic administration of penicillin and sulphadital in the treatment of perforating lesions of the eye.** Acta ophth. **28**:489-498, 1950.

The value of routine systemic administration of penicillin and sulphonamides was proven by an investigation on 106 fresh ocular perforating lesions; 123 similar lesions were used as controls. Hospitalization was shortened and the degree of visual disability reduced. When treatment was instituted within 24 hours of the injury, enucleation was less frequent than in the control group but when more than 24 hours had elapsed following the injury, the effect of treatment was insignificant. (5 tables) Ray K. Daily.

Paufique, L., and Rougier, J. **Beta ray therapy in ocular pathology.** Ann. d'ocul. **184**:577-585, July, 1951.

Beta ray therapy properly administered is a valuable adjunct to the treatment of numerous corneal diseases and degenerations. In the 13 cases treated, improvement was marked. There was one case of recurrent pterygium, three of acne rosacea, and three of severe corneal trauma. In 40 cases of corneal transplantation beta ray therapy was apparently justified

and nine disciform degenerations and seven severe corneal burns were benefited by the treatment. The authors used radium D in a monel metal container with a suitable filter. The average treatment consisted of four 3-minute exposures at weekly intervals. After an intermission of one month another similar series can be used. Chas. A. Bahn.

da Silva, A. G. **Retro-trans-illumination. Photomicrography.** Arq. brasil. de oftal. **14**:1-27, 1951.

The apparatus for photomicrography of the ocular structures consists of the slit-lamp as the light source, a corneal microscope, and a camera which is adapted to an ocular of the microscope. Koeppe's mirror is used to reduce the angle of incidence of the light, which is reflected from the retina. Corneal vascularity, ulcerations, keratic precipitates, lens vacuoles and sutures, and the anterior third of the vitreous can be photographed as well as many other normal and pathologic conditions. It is essential, however, that the object to be photographed be illuminated by light rays reflected from the retina, and some degree of mydriasis is necessary. The author believes that the iris can not be satisfactorily examined except at the pupil and in atrophic regions. Attempts at color photography have failed. (10 figures)

James W. Brennan.

Solignac, G., and Houdart, R. **The frontiers of ophthalmology.** Ann. d'ocul. **184**:620-625, July, 1951.

The ophthalmologist should not overlook the extra-ocular factor in ophthalmic symptoms especially if the central nervous system is involved. In one instance of right cerebellar pineoblastoma head tilting and partial facial paresis was overlooked. Left frontoparietal pain, trembling of the right hand and dizziness were overlooked in a patient with visual difficulty, and right frontal lobe glioblastoma. Increased intracranial tension is the condition most frequently overlooked.

Chas. A. Bahn.

6

OCULAR MOTILITY

Adamantiadis, B. **Two cases of divergence insufficiency.** Ann. d'ocul. **184**:531-535, June, 1951.

In divergence insufficiency a variable esophoria or esotropia exists for distance which is independent of convergence. Diplopia and other manifestations of oculomotor imbalance follow prolonged distant fixation. The symptoms are increased by ocular or extraocular fatigue and divergence insufficiency should not be confused with spastic accommodation and convergence. Two cases are discussed.

Chas. A. Bahn.

Castanera Pueyo, Alfonso. **Practical results of orthoptic treatment of the sensory disturbances in strabismus.** Arch. Soc. oftal. hispano-am. **11**:502-512, May, 1951.

Preoperative orthoptic treatment is given to correct the sensory disturbances, surgery to correct the deviation, and postoperative orthoptic treatment again to secure binocular stability. From 528 cases of strabismus the author selected 100 in patients between three and ten years of age. The period of treatment varied between five days and four months. Fifty-two cases were cured by orthoptic treatment, 85 recovered normal sensory perception, and 23 were classified as failures. Amblyopia is treated by occlusion and monocular exercises until vision rises to 0.5 when binocular exercises are instituted. In young children this may be attained in a few days, in children over six treatment may extend over a period of six months. Anomalous correspondence is treated by Kramer's technique which is described in detail. Ray K. Daily.

Talayero Moreno, J. M. **Diagnosis of motor anomalies, called concomitant stra-**

bismus. Arch. Soc. oftal. hispano-am. 11: 485-493, May, 1951.

In 528 cases of squint, the author found motor anomalies of a paretic type in 80 percent. The majority began with a primary paralysis as the cause of strabismus, followed by secondary muscular contractures, spasms, and inhibitional paralysis. It is congenital or sometimes acquired in early infancy. Muscle spasm is rarely the primary etiologic factor. In 60 percent of cases a vertical muscle was involved. The vertical disturbances are the primary cause of loss of fusion. Paralyses of the horizontal muscles are soon obscured and sometimes compensated.

Ray K. Daily.

Talayero Moreno, J. M. **Surgery of strabismus in infancy and in adults.** Arch. Soc. oftal. hispano-am. 11:494-501, May, 1951.

Every case of strabismus not corrected by conservative therapy in six months should have correction of the pathologic motor anomalies, which cause the deviation. Cosmetic correction may be delayed. Vertical motor anomalies should be corrected first, unless the horizonal deviation is very large; in that case both anomalies may be corrected at one time. In excess convergence a bilateral recession of the internal rectus muscles is advocated in preference to excessive weakening of one muscle.

Old cases of strabismus are complicated by organic changes and the results of operation are less satisfactory than in those of recent origin. Restoration of function stabilizes the surgical result of the operation; in purely cosmetic corrections it is always uncertain. Ray K. Daily.

Vannas, M., and Svanljung, H. **A case of ocular torticollis successfully operated upon.** Acta ophth. 29:233-237, 1951.

A 9-year-old boy had ocular torticollis and abnormal headposture since infancy. He complained of diplopia and a congenital paresis of the right superior rectus and left inferior rectus was found. The right superior rectus was advanced 5 mm., and moved 2 mm. to the right from its original insertion, and the right inferior rectus was recessed 5 mm. and moved one half of its width outward. The malposition of the head was corrected, and the diplopia relieved. (6 figures)

Ray K. Daily.

Villaseca, E. A. **Some observations on the treatment of strabismus in children.** Arch. Soc. oftal. hispano-am. 11:468-484, May, 1951.

If the patient is over three years old, the examination includes a history, visual acuity test, cover test, ocular motility test, and examination with the synoptophore. At the second examination refraction is determined sciascopically under atropine cycloplegia, the fundus is examined, and the synoptophore examination repeated. In patients under three years of age, the examination is limited to the cover test, ocular motility, refraction under cycloplegia, funduscopy, and determination of the angle of strabismus by the corneal reflexes. Refraction is corrected in cases of aniseiconia and in accommodative strabismus. Occlusion is indicated in every case of strabismus and should be maintained as long as the eyes are crossed; it may be discontinued only for orthoptic exercises, or when the deviation has been corrected surgically. Orthoptic treatment and surgery are combined in the treatment of strabismus. The size of the angle of deviation is of no importance, as a small angle of deviation may lead to more grave functional disturbances than a large one. The importance of the vertical component is shown by the fact that out of 42 children with strabismus 14 had a vertical component. Operation is in-

dicated if lenses which correct the refractive error fail to straighten the visual axes. It is performed in congenital strabismus at the age of two or three, and in the cases which develop later when a refractive correction fails to correct the strabismus. The aim of surgery is to straighten the visual axes, so that binocular vision may have an opportunity to develop. Ray K. Daily.

7

CONJUNCTIVA, CORNEA, SCLERA

Bailliart, P. **Reflections on the campaign against trachoma in the French zones of Africa.** Rev. intern. du trachome **28**:196-201, 1951.

A survey in 1926 showed that trachoma in Africa was rare below the latitude of 11 degrees north. Since then the endemic area has moved slowly southward to 5 degrees north. Trachoma spreads from the main highways of communication; the Moors from the north were the original agents of transmission. Bailliart stresses the need for strict control of the still healthy areas of Africa especially in Madagascar, and the advises strategically placed anti-trachomatous centers.

James E. Lebensohn.

Bartolozzi, R. **Blue sclera and keratitis filamentosa.** Arch. Soc. oftal. hispano-am. **11**:754-761, July, 1951.

A man, 21 years old, who was operated upon for a traumatic osteo-arthritis was found to have intensely blue scleras, slight lacrimation, nystagmus, and a filamentous keratitis caused by the rupture of small vesticles. Whether the simultaneous presence of the two affections is a coincidence, or has a biologic basis is undecided. Ray K. Daily.

Bessière, E., and Teulières, J. **Note on experimental vascularization of the cornea.** Arch. d'opht. **11**:268-271, 1951.

The authors review the subject of corneal vascularization from the initial observations on pannus by Coccius in 1852 to the recent studies of Swindle, Offret and Chauvet and of Cogan. In an experimental study, Bessière and Teulières produced vascularization of the rabbit cornea by implanting sterile metallic foreign bodies. Vascularization occurred regularly when the implant was 3 mm. or closer to the limbus but at greater distances no new vessels formed. The authors then produced corneal burns involving about one third of the corneal thickness. As in the foreign body experiment, vascularization occurred only when the burn was near the limbus. In a third part of their study they injected different solutions into the corneal lamellae. This too led to corneal vascularization only when the injections were made near the limbus. Anesthetics used topically or by retrobulbar injection did not influence the vascularization. The authors do not accept the theory advanced by Cogan that corneal edema furnishes the stimulus for new vessel formation; they favor instead the toxin theory, that toxins produced by tissue damage furnish the stimulus.

Phillips Thygeson.

Cucco, Giovanni. **Subconjunctival localization in a case of Roch's mesosomatic lipomatosis.** Ann. di ottal. e clin. ocul. **77**:291-298, July, 1951.

A case of bilateral subconjunctival lipoma, in a 77-year-old man, with similar subcutaneous nodular lipomatous formations in other parts of the body is reported. This clinical syndrome is thought to be a manifestation of a mesenchymal dysontogenesis. The bilateral occurrence of subconjunctival lipomas in a case of generalized lipomatosis suggests a new avenue of approach to the study of mesenchymal dysembryoplasias of the conjunctiva. (References)

Harry K. Messenger.

Eriksen, Arne. **Allergic origin of a case of vernal conjunctivitis.** Acta ophth. **29**: 91-94, 1951.

A case of typical vernal catarrh was found to be due to sensitivity to cow's epithelium. Therapy with extract of cow's epithelium led to the relief of the subjective as well as the objective symptoms. Eriksen believes the vernal conjunctivitis to have been allergic in origin.

Ray K. Daily.

Fornaro, Luigi. **The effect of ACTH and cortisone upon the healing of corneal wounds.** Rassegna ital. d'ottal. **10**:90-101, March-April, 1951.

Twenty-four rabbits were used in the experiment described, 8 were given cortisone, 8 ACTH and 8 were used as controls. Aseptic wounds were induced in the clear cornea with the trephine. Cortisone accellerated the process of cicatrization and ACTH retarded healing. (8 figures)

Eugene M. Blake.

Grönvall, H., and Ohlsson, J. **The topography of corneal foreign bodies.** Acta ophth. **29**:169-182, 1951.

An analysis of patients at the Ophthalmic Clinic at the Malmo General Hospital from 1919 to 1948, and at the Ophthalmic Clinic of the Central Hospital in Kristianstad from 1943 to 1948 shows no difference in the number and distribution of corneal foreign bodies between the right and left cornea. They are more frequent on the lower than on the upper corneal half and in the nasal than in the temporal half. There is a strong tendency to lodge below and somewhat nasally to the corneal center. (4 tables, 4 figures)

Ray K. Daily.

Henricson, H. O. **The effect of aureomycin on herpetic corneal affections and trachoma.** Acta ophth. **28**:517-521, 1950.

Of 11 cases of herpetic corneal disease, 8 reacted well to aureomycin; and of 15 trachoma patients, 9 of which had trachoma granules, 7 reacted well to aureomycin. The effect of the drug was especially favorable in acute cases. (2 tables)

Ray K. Daily.

Höhr Castan, J. M. **Treatment of virus keratitis.** Arch. Soc. oftal. hispano-am. **11**: 272-275, March, 1951.

The author advocates the daily intravenous administration of 10 cc. of urotropin for virus keratitis, particularly keratitis disciformis and that following an attack of grippe.

Ray K. Daily.

Kall, Erik. **Observations on the blood of patients with conjunctivitis trachomatosa.** Acta ophth. **28**:511-515, 1950.

This is a description of the spherical bodies and threadforms in the blood of patients with trachomatous conjunctivitis. A possible evolution of these bodies is described. (9 photomicrographs)

Ray K. Daily.

Kimura, T. **Statistics of trachoma by MacCallan's classification.** Rev. intern. du trachome **28**:216-221, 1951.

Analysis of 1,186 cases of trachoma treated at the Mito Red-Cross Hospital in the period, 1947-49, showed the following percentage in each stage: 1. 34 percent; 2. 32 percent; 3. 28 percent; 4. 6 percent. The greatest number of cases in group 1 were infants, in 2, primary school children, in 3, young adults, and in 4, older adults.

James E. Lebensohn.

MacCallan, A. F. **The signs and treatment of trachoma.** Rev. intern. du trachome **28**:175-195, 1951.

MacCallan stresses that with mass infection of the indigenous population infants usually succumb to the disease within a month of birth. He recognizes four stages, with the following char-

acteristics: 1. follicles or generalized lymphoid infiltration; 2. papillary hypertrophy or bleb-like excrescences; 3. thickening of the tarsal plate by inflammatory deposits which cause some ptosis; commencing cicatrization, which may cause trichiasis and entropion; 4. "recovery"; the normal epithelium has been replaced by scar-tissue epithelium, and the subepithelial infiltration has been absorbed or replaced by cicatricial tissue. The conjunctiva is now smooth but usually shows lines of cicatricial tissue. The lids may appear normal or deformed.

James E. Lebensohn.

Oksala, Arvo. **On the pigmented line of the cornea.** Acta ophth. 29:95-102, 1951.

Two cases of pigmentation of the corneal epithelium are reported. In the first case linear and roundish deposits of yellow granules were seen in and below the corneal epithelium. They occurred after parenchymatous keratitis due to congenital syphilis. In the second case a yellowish line formed during tuberculous sclerokeratouveitis in and below the corneal epithelium, and disappeared after 62 days. The literature on the pathogenesis of these lines is reviewed. (2 figures)

Ray K. Daily.

de la Peña, Adolfo. **Therapy of leprous keratitis.** Arch. Soc. oftal. hispano-am. 11: 161-167, Feb., 1951.

D.D.S. (diamino-defenil-sulfonas) has a remarkable therapeutic effect in general leprosy and fails in keratitis, because of the avascularity of the cornea. The most common ocular lesion in leprosy is a severe and torpid keratitis due to the lagophthalmos caused by a leprous polyneuritis. The author attempts to protect the exposed cornea by tarsorraphy and operations for ectropion, and from dryness at night by air-tight shields. He could not verify the beneficial effect of the patient's own serum reported by Dostrovsky and Ticho but histiotherapy of Filatov stimulates a regentration of the corneal epithelium, and a clearing of opacities which have not yet become organized. He reports a case of a man, 38 years old, whose vision was reduced to perception of large objects, and in whom therapy appeared futile over a period of several years. Under histiotherapy his vision rapidly improved to 1/10, and the corneal epithelium regenerated. The author also recommends autohemotherapy, subconjunctivally or preferably into the anterior chamber, in order to bring a greater concentration of D.D.S. into the aqueous.

Ray K. Daily.

Poyales, A. **Partial penetrating keratoplasty.** Arch. Soc. oftal. hispano-am. 11: 746-753, July, 1951.

The patients are given streptomycin and penicillin for four weeks before operation. The cadaver eyes used for the graft are enucleated no later than 12 hours after death in the summer, and two days in the winter, and are kept in an ice box for a maximum of three days. A round graft is preferred and the pupil is kept under eserine miosis, which makes easier centralization of the graft and protects the lens. The grafts are sutured by border-to-border sutures which are removed when ciliary irritation appears, between about the 10th to 15th day. After the operation, a retrobulbar injection of novocain and 20-percent alcohol is made to eliminate the axon reflexes originating from the multiple corneal sutures. The complications are: 1. a violent ciliary reaction caused by the heteroproteins of the graft when it has not been conserved on ice sufficiently long; 2. hypertension, controlled by paracentesis in purely corneal lesions and more difficult to control in eyes with deeper pathological processes; 3. delayed anterior chamber may be caused by faulty fitting of the graft, which must be corrected by additional

sutures, or there may be penetration of a suture into the anterior chamber, and the suture must be removed; 4. a prolapse of the iris must be excised, or simple synechia separated, as contact of the graft with the iris threatens its invasion by mesenchymal elements; 5. late opacification of the graft, which is the most serious of all complications. It appears about three months after the operation and is at first limited to a portion of the graft, but eventually involves all of it, especially in the middle corneal layers. In one case this process regressed following an implant after Filatov. Ray K. Daily.

Rossi, A. **Vernal conjunctivitis.** Rassegna ital. d'ottal. **20**:48-58, Jan.-Feb., 1951.

Rossi states that vernal catarrh is a juvenile disease which affects persons of the lymphatic type. There is a general glandular hypertrophy, nasal adenopathy, thymus enlargement and, not rarely, splenomegaly. The disease tends to clear when sexual maturity occurs, marking the lesion as an endocrine disturbance. With the appearance of the menarch in girls, and the adrenal changes in boys, there occurs a progressive urinary elimination of the 17 ketosteroids produced in the reticular zone of the adrenal cortex in both sexes. At the same time there is an increase of cortisone. Animal experiments have confirmed the reduction of lymphatic tissue when glandular extracts are administered. Eugene M. Blake.

Silvan, F. **Report of a case of recurrent postmenstrual herpetic keratitis.** Arch. Soc. oftal. hispano-am. **11**:168-178, Feb., 1951.

The patient, 29 years old, developed corneal herpes, after an attack of grippe. Later she had an attack of angioneurotic edema which subsided when she became pregnant. Five months following delivery, the corneal herpes, associated with herpes of the lips, recurred at every postmenstrual period. Corneal sensitivity was diminished. The outbreak of herpes was preceded by subjective symptoms of conjunctivitis and itching. The corneal lesion was superficial and was alleviated by the local instillation of vasoconstrictors. The literature on virus lesions in the pathogenesis of which allergic or endocrine factors have a part is reviewed. The patient was cured by daily injections of 10 mgms. of progesterone for three days following menstruation. Ray K. Daily.

Sjögren H. **Some problems concerning keratoconjunctivitis sicca and the sicca-syndrome.** Acta ophth. **29**:33-47, 1951.

Keratoconjunctivitis sicca is not a disease sui generis and the final cause is still not known. Because a general infection is sometimes associated with the disease, infection may be an etiologic factor. The greater frequency of the syndrome in old women, and the fact that sometimes patients with this syndrome appear older than their age, suggest an endocrine disturbance as a cause. Ray K. Daily.

Talkov, R., Colpoys, F., Davis, R., Papper, S., and Fienberg, R. **Rheumatoid scleral nodules (scleromalacia perforans) treated with cortisone.** Arch. Int. Med. **87**:879-888, June, 1951.

The effect of cortisone on the scleral nodules in a 61-year-old patient with rheumatoid arthritis was studied. Before treatment 11 scleral nodules were seen. Cortisone was administered for 38 days and the eyes showed prompt improvement. Biopsy of the nodules after the 1st, 14th, 24th and 31st day of treatment showed histologic changes which were in keeping with clinical improvement. Microscopic studies showed involution of the rheumatoid nodule, probably accelerated by the cortisone treatment.

F. M. Crage.

Van Tien, P. **Treatment of trachoma by aureomycin.** Rev. intern. du trachome. **28**:202-215, 1951.

The author emphasizes the value of aureomycin in treating the secondary infections associated with trachoma, although the drug apparently does not act on the trachoma virus. He considers drops more effective than ointments. The simultaneous use of penicillin is useless.

James E. Lebensohn.

Valcarce Avello, Joaquin. **Anatomic and biochemical problems of keratoplasty.** Arch. Soc. oftal. hispano-am. **11**:518-549, May, 1951.

The literature on the fate of the tissue in the corneal graft is reviewed, and the examination of four opaque and one transparent grafts enucleated after the death of the patient is reported. In cicatrization of corneal wounds, the keratoblasts arise from macrophages, histiocytes and fixed corneal cells. In experimental opaque grafts the graft is found replaced, and there are always inflammatory signs such as infection, inclusion of the iris, or vascularization. In transparent experimental grafts or well tolerated opaque grafts, the question of tissue replacement is not entirely clear, but there are indications that there is a slow and partial replacement of the cells of a transparent graft. In experimental grafts reinnervation appears after the first months, and after four months has advanced so far that intraepithelial termination of nerves can be observed. A study of histologic sections of human opaque grafts indicate that there is at least a partial replacement, particularly if the graft is vascularized; this could not be demonstrated in grafts which are not vascularized. In transparent human grafts the examination indicates that the graft survives. The section of a human transplant shows subepithelial innervation and innervation of the deep parenchymal layers on which the transparency of the graft depends. To improve the results of keratoplasty, it is necessary to investigate the problem of tissue incompatibility.

Ray K. Daily.

Weekers, R., and Delmarcelle, Y. **Aqueous veins and newly formed veins in a corneal leucoma.** Acta ophth. **29**:85-89, 1951.

Aqueous veins and newly formed veins in a vascularized leucoma of an eye with absolute glaucoma are described. These newly-formed vessels are probably derived from the normal aqueous veins which originate in Schlemm's canal.

Ray K. Daily.

8

UVEA, SYMPATHETIC DISEASE, AQUEOUS

Garcia Miranda, R. **Treatment of traumatic iridodialysis by diathermycoagulation.** Arch. Soc. oftal. hispano-am. **11**:513-517, May, 1951.

The literature on surgery of iridodialysis is reviewed and a case treated successfully by Safar's method of diathermycoagulation is reported. Ray K. Daily.

Matteucci, P., and Heer, G. **The causes of the degenerative cellular aspects of the pathologic aqueous.** Rassegna ital. d'ottal. **20**:3-7, Jan.-Feb., 1951.

The authors studied the changes which occur in the aqueous of chronic uveitis and kerato-hypopyon. Citrated fasting blood was mixed with an equal part of aqueous removed from the anterior chamber of the same patient or animal. Normal aqueous showed no leucolytic action while that of chronic uveal disease showed 20 percent lysis. Thus the presence of a proteolytic ferment can be considered a fundamental factor of the cellular degeneration. Normal aqueous is considered to be an interstitial fluid, but the inflammatory aqueous of uveitis, be-

cause of physico-chemical and cytological changes, is an exudate.

Eugene M. Blake.

Redslob, E. **Sympathetic ophthalmia; a myth?** Ann. d'ocul. **184**:536-539, June, 1951.

The author believes that the term "sympathetic ophthalmia" has often been used to include unclassified binocular uveal diseases; it is a definite disease entity, but much more rare than has been generally assumed. Chas. A. Bahn.

Rieger, H. **Ocular signs of acquired toxoplasmosis in the adult.** Med. Klin. **46**: 794, July 20, 1951.

In small children a clinical diagnosis can be made with great probability when the patient exhibits the triad of manifestations that consists of central choroido-retinitis, cerebral calcification and the sequelae of encephalitis, particularly xanthochromic cerebrospinal fluid, even in the absence of a serologic examination. In the adult the finding of central external exudative retinitis alone is not pathognomonic of toxoplasmosis; a serologic test is essential for its unequivocal recognition. F. H. Haessler.

Schöne, R., and Steen, E. **Antistreptolysin titre and antistaphylolysin titre in acute iridocyclitis.** Acta ophth. **29**:201-211, 1951.

In an effort to clarify the etiology of acute iridocyclitis, the antistreptolysin and antistaphylolysin titer of the serum of 105 patients with iridocyclitis of doubtful etiology was determined, and compared with that of 552 normal blood donors. The antistaphylolysin titer did not differ from that of the control group, but the antistreptolysin titer was raised sufficiently to indicate that hemolytic streptococci may be of some etiological importance in the pathogenesis of acute iridocyclitis. (3 tables) Ray K. Daily.

Vesterdal, Elise. **ACTH in the treatment of sympathetic ophthalmia.** Acta ophth. **29**:239-254, 1951.

Six cases of sympathetic ophthalmia were treated with ACTH. All showed initial rapid improvement. In one case, of 50 days standing, the remission was partial and the symptoms recurred on withdrawal of the drug. Three patients recovered completely; in two of these, the exciting eye was enucleated before treatment was instituted. One patient made a complete recovery in the exciting eye, even though a discission for cataract was performed in the course of treatment. One patient was still under treatment at the time of the report. Ray K. Daily.

9

GLAUCOMA AND OCULAR TENSION

Foroni, C. **Triangular valvular sclerotomy ab externo (preliminary note).** Ann. di ottal. e clin. ocul. **77**:277-278, June, 1951.

This operation for glaucoma consists essentially of a 7-mm. incision along the limbus above, and a vertical 3-mm. incision extending upward from the midpoint of the horizontal incision. In this way two mobile triangular scleral flaps are formed which have a valvelike action. A conjunctival flap is first turned down and afterwards sutured back in place. The results of the operation are excellent and the technique is simple.

Harry K. Messenger.

Kluzer, G., and Matteucci, P. **Present concept of primary glaucoma.** Rassegna ital. d'ottal. **20**:83-89, March-April, 1951.

Prefrontal lobotomy, performed upon seven psychopathic patients and two patients with stubborn trigeminal neuralgia produced immediate reduction of ocular tension. The decrease continued even when the arterial pressure, after an initial fall, had returned to its original

value and was similar in cases of uni- and bilateral lobotomy. The second operation did not induce a new modification of tension.

There is evidence of functional diencephalic alteration in many glaucomatous patients. The experiments conducted for the first time in man seem to confirm the existence of cortical vasomotor centers, attesting particularly to the influence of cortical centers in ocular tension. The constant vascular alterations of the glaucomatous are strictly related to nervous factors, which of themselves are, however, not sufficient to explain all of glaucoma.

The authors accept the concept of a "central nervous factor" in the regulation of the ocular tension and in the pathogenesis of glaucoma. The control tonus is regarded as a complex function which, analogous to other vegetative functions, is dependent upon the action of numerous centers, which may be central, that is, cortical, diencephalic, bulbar or medullary, or peripheral, that is, in the sympathetic, the carotid sinus, or the para-sympathetic ganglia. (1 plate)

Eugene M. Blake.

Salomaa, Salme. **Increased intraocular pressure associated with herpes zoster ophthalmicus without any signs of iritis.** Acta ophth. **29**:227-231, 1951.

This is the fifteenth case of acute glaucoma without signs of iritis in ophthalmic herpes zoster to be reported. The 67-year-old man developed a primary rise in ocular tension; when the tension was normalized with miotics he developed a herpetic keratitis, which recurred seven months later. The etiology and pathogenesis of the disease are briefly discussed. Ray K. Daily.

Sunde, Olav. **The relationship between simple glaucoma and general cardiovascular diseases.** Acta ophth. **29**:213-226, 1951.

After studying 100 glaucoma patients and 100 normal controls, Sunde concluded that there is no causal relationship between simple glaucoma and general arterial hypertension and the other cardiovascular diseases. Patients with glaucoma showed no difference in peripheral capillary fragility, urinalysis, electrocardiographic findings, and blood pressure from the normal for the age group. Ray K. Daily.

10

CRYSTALLINE LENS

Auricchio, G. **The development of cataract in high myopia.** Rassegna ital. d'ottal. **20**:8-14, Jan.-Feb., 1951.

The author made a statistical biomicroscopic study of the morphology of the lens in cases of myopia above 10 diopters, and correlated the findings with the age of the patient. He concludes that there is in myopia a state of dystrophy of the lens fibers which results in an increased loss of transparency. These changes, however, appear relatively late and are secondary to alterations of the choroid and retina, especially the former, since this membrane determines the chemical composition and the physicochemical structure of the endocular fluid and thus indirectly influences the processes of nutrition of the lens.

Eugene M. Blake.

Galindez Iglesias, F. **Atopic cataract.** Arch. Soc. oftal. hispano-am. **11**:697-705, July, 1951.

A review of the literature is followed by the report of a case of a bilateral initial lenticular cataract which occurred in a woman, 40 years old, with scleroderma. The familial history was negative.

Ray K. Daily.

Larsen, Victor. **Some observations on cataract extraction.** Acta ophth. **29**:3-24, 1951.

Larsen analyzes 123 cases of round pupil extraction and 176 histories of cases of extraction with iridectomy. In round pupil extraction visual acuity is better, postoperative recovery more rapid, the cosmetic effect more agreeable, the risk of iris prolapse no greater, and the risk of vitreous loss less. The favorable results are attributed to meticulous attention to detail during the operation and careful postoperative nursing. The technique of the operative procedure is described.

Ray K. Daily.

Pallares, J. **The results of cataract extraction with the Arruga forceps.** Arch. Soc. oftal. hispano-am. **11**:706-723, July, 1951.

One hundred and seven cataract extractions are tabulated and analyzed. In 12 cases the capsule could not be grasped; four of these were delivered intracapsularly with Arruga's erisophake, three by the Smith method, and two with the Weber loop. The operation was intracapsular in 81 cases, and extracapsular in 14. The average visual acuity in the intracapsular extractions was 1.08, and in the complicated cases 0.73. Nine cases with vitreous loss are described in detail. The Arruga forceps is so constructed that the percentage of intracapsular extractions can be raised by increasing pressure with the Arruga hook. Ray K. Daily.

Pallares, J. **Results of intracapsular extraction with the Moreno suction tip.** Arch. Soc. oftal. hispano-am. **11**:724-732, July, 1951.

The author believes that the Moreno suction tip greatly simplifies the technique of phacoeresis without impairing its efficiency. (3 figures, 4 tables)

Ray K. Daily.

Roveda, J. M. **The crystalline lens, "visual stabilizer."** Arq. brasil. de oftal. **14**: 28-30, 1951.

Starling has referred to the crystalline lens as the "visual stabilizer" because its unique texture and arrangement of fibers enable it to correct the optical defects of the eye. Investigators who have measured the refractive power of the lens and the long axis of the eye have shown that there is great variation in refractive power, and that in adults, there is no positive correlation between the axial length of the eye and refraction, nor between the corneal radius and total refraction. Rushton's method of measuring the axial length of the eye by X-rays is briefly described. James W. Brennan.

Roveda, J. M. **Suggestions for cataract extraction.** Arq. brasil. de oftal. **14**:55-61, 1951.

This article summarizes the author's technique for cataract extraction, including his preference in preparing the operative field, a unique system of draping the area. Retrobulbar novocain and corbasil are used for anesthesia in addition to akinesia. Curare, however, is not routinely used, nor are other adjuncts to anesthesia. The incision, corneo-scleral sutures, and the actual extraction are described. The highlight of the article is the opinion that ocular surgery should be 80 percent preparation and 20 percent intervention. James W. Brennan.

Ullberg-Olsson, Karin. **The homogeneity of the lens of the eye with regard to protein.** Acta ophth. **29**:191-199, 1951.

In her own work with bovine lenses the author sought to determine whether or not the lens protein of the eye is homogeneous. Preparations of the inner and outer parts of the lens were hydrolyzed with hydrochloric acid and quantitative determinations with biological methods made of nine of the amino acids formed. There is a homogeneity of the outer parts of the lens and outer part of the lens nucleus. The inner part of the

nucleus differs from the outer part in lysine, arginine and tyrosine content. The lens protein is homogeneous as far as the amino acid components are concerned. Its protein substances differ from those of the lens capsule and the cornea. Alpha, beta and gamma crystalline and albumenoid fractions isolated by earlier investigators probably represent different stages of dehydration of the same protein. (3 tables) Ray K. Daily.

11

RETINA AND VITREOUS

Alvarez Luna, R. A. **Purtscher's traumatic angiopathy.** Arch. Soc. oftal. hispanoam. **11**:369-372, April, 1951.

The literature is reviewed and a case reported. No new viewpoints are presented. (1 figure) Ray K. Daily.

Arruga, H. **Preventive diathermy in retinal detachment.** Arch. Soc. oftal. hispanoam. **11**:392-394, April, 1951.

The decision for prophylactic surgery for retinal detachment in eyes with areas of retino-vascular degeneration, or incomplete retinal holes, or holes without detachment, depends on whether the patient has one normal eye, or whether the eye under consideration is the only eye. If it is the only eye, Arruga makes a drawing of the fundus and checks the lesion for signs of progression. The presence of photopsias shows that the retina is not fixed and operation is indicated. Prophylactic surgery should be practiced with caution. The electrode is passed rapidly over the diseased area, without producing any ophthalmoscopic evidence of coagulation. During the next few days the retina appears somewhat opalescent, but pigmentary changes appear rapidly, and a chorio-atrophic focus develops in the diathermically treated zone. Arruga used this technique in 40 cases without encountering complications.

Ray K. Daily.

Bailliart, P. **The retinal capillaries.** Arch. Soc. oftal. hispano-am. **11**:353-361, April, 1951.

The ophthalmoscopic signs of capillary fragility, edema, and hemorrhage are much more informative than the clinical pressure tests for petechial hemorrhage. Changes in vascular permeability precede capillary fragility and can be observed in the conjunctival network, with its chemotic reaction, in the ciliary network by means of the passage of fluorescein into the anterior chamber, and, most easily in the retinal capillaries. A great increase in capillary permeability leads at first to a serous capillary transudation and finally to an albuminuria of the tissues. The asphyxia of the tissues, which takes place in the liver and the heart, can be seen in its initial stages in the retinal vessels. The increase in hydrostatic pressure which drives the blood column through the vessels can be measured at the entrance into a vessel and its exit. The foci of capillarities seen in the senile retina are caused by a failure of the interchange between the vessels and the tissues. A narrow blood column may supply enough nutrition for the tissues, and a dilated vessel may function inadequately. Changes in the vessel caliber may not all be visible ophthalmoscopically. In addition to the circular fibers, a contraction of which is detectable, there are muscle fibers along the axis of the arteriole which act on its tone without modifying its external appearance. An examination of the state of the capillaries, through a study of the retinal circulation, should precede treatment.

Ray K. Daily.

Candian, F. L. **Late results of Fukala's operation.** Rassegna ital. d'ottal. **20**:29-39, Jan.-Feb., 1951.

Twenty-three cases of myopia complicated by separation of the retina and with changes in the macular region were

operated upon by Fukala's technique. The patients were observed for periods varying from three to fourteen years. Detachment recurred in four of the eyes, three of which came to second operation; two of these retained central vision. The author believes that the improvement which follows Fukala's operation results from an improved condition of the tissues of the ocular fundus brought about by moderate hypotension, and alterations of the vitreous associated with the malignant myopia. Such detachments offer a good prognosis. Two cases with macular hole, which retained central vision, are reported. Eugene M. Blake.

Costi, C. **Diagnostic errors, caused by inadequate examination of the posterior portion of the vitreous.** Arch. Soc. oftal. hispano-am. 11:142-147, Feb., 1951.

Five cases of moderate disturbance in visual acuity are reported to demonstrate the importance of biomicroscopy of the posterior portion of the vitreous. Posterior detachment of the vitreous is more frequent than is recognized and is many times overlooked in a superficial examination. Disturbance in visual acuity caused by the detachment is moderate. Since they are situated close to the posterior pole, the opacities on the posterior surface of the vitreous do not move with ocular movements, which differentiates them from floating opacities in the vitreous. This condition may be confused with optic neuritis or retinal detachment because the optic disc is obscured. The anterior ocular segment is generally normal, but the anterior vitreous has evidence of liquefaction and white spots, which are indicative of a posterior uveitis. Slitlamp examination reveals a band of density corresponding to the posterior margin of the vitreous. Ophthalmoscopy always reveals a membrane in the posterior vitreous situated 4 to 8 diopters anterior to the retina. The prognosis of the lesions is as a rule good, but the condensation on the posterior vitreous does not disappear, as the vitreous does not reattach to the retina. Treatment should be directed to the coexisting uveitis, with atropin, heat, and dionin, and to the improvement of the ocular circulation, for which placental extract and implants are useful. The author is convinced that a torpid uveitis plays as important a role in vitreous detachment as does myopia or senility.

Ray K. Daily.

Laupus, W., and Bousquet, F. **Retrolental fibroplasia; role of hemorrhage in its pathogenesis.** Am. J. Dis. Child. 81:617-626, May, 1951.

Serial ophthalmoscopic examinations were made in 72 premature infants who weighed less than 1,650 grams at birth. Vitamin E was started with the first feeding. Retrolental fibroplasia occurred in its partial or complete form in eleven infants. The authors feel that vitamin E prophylaxis is disillusioning and discouraging in view of these figures. F. M. Crage.

Panepinto, Vincenzo. **Critical considerations and anatomicoclinical deductions on the problem of the pathogenesis of diabetic retinopathy.** Ann. di ottal. e clin. ocul. 77:233-253, June, 1951.

A working theory of the pathogenesis of diabetic retinopathy can be formulated only tentatively. The ophthalmoscopic picture is fairly characteristic, though not pathognomonic. Its distinctive features are punctate red spots, exudative spots, the absence of edema, and of any characteristic changes in the retinal arteries. The histologic picture is characterized by the presence of a considerable number of capillary aneurysms and the inconstancy or at least aspecificity of arterial lesions. The pathogenesis depends directly on the diabetes and not on any coexisting arteriosclerosis, hypertension, or nephropathy. The associated intercapillary glomerulo-

sclerosis can explain the relatively frequent finding of renal damage and makes it probable that the retinopathy is the local expression of a degenerative process involving the whole capillary system of the organism. The damage to the capillary network is not linked to the hyperglycemia or to the deficiency of insular hormone, but to the whole complex of systemic and local changes incidental to a deranged carbohydrate metabolism and can not be recognized by any of our present diagnostic means. Insulin has no direct action in producing the retinal lesions, but the abrupt shift which it may cause in the concentration of sugar in the blood may result in functional and structural alterations in the capillaries. (References)

Harry K. Messenger.

Spoont, S., Dyer, W., Day, R., and Blazer, H. **Incidence of diabetic retinopathy relative to the degree of diabetic control.** Am. J. M. Sc. **221**:490-494, May, 1951.

Fifty patients with diabetes of at least ten years' duration were studied to determine the relationship between diabetic control and the incidence of diabetic retinopathy. Retinal lesions were found to be more frequent in the "poorly controlled" diabetics. F. M. Crage.

12

OPTIC NERVE AND CHIASM

Parin, Paul **Optic atrophy through arteriosclerosis of the internal carotid artery.** Schweiz. Arch. f. Neurol. u. Psychiat. **67**:139-174, 1951.

The author describes three patients in whom an optic nerve lesion was caused by pressure from an arteriosclerotic, calcified carotid artery. In the acute stage there may be temporary choked disc and amaurosis. Optic atrophy may follow. Nasal hemianopsia, horizontal hemianopsia and irregular concentric contraction of the field can be observed. Remissions and exacerbations of the optic nerve symptoms are common. A calcified carotid artery seen in the X ray and generalized arteriosclerosis are important for the diagnosis. A combination of pressure and ischemia locally is responsible for the malfunction of the optic nerve. The differential diagnosis includes various vascular lesions such as thrombosis and aneurysm, dilation of the third ventricle, intracranial tumors and optochiasmatic arachnoiditis. Conservative treatment with vasodilators and retrobulbar injection of atropine and the surgical opening of the optic canal from above are briefly discussed. (8 figures, references) Max Hirschfelder.

13

NEURO-OPHTHALMOLOGY

Beierwaltes, W. H. **Irradiation of the pituitary in the treatment of malignant exophthalmos.** J. Clin. Endocrinol. **11**: 512-530, May, 1951.

Ten patients with malignant exophthalmos and one with obstinate progressive exophthalmos were treated with X ray. Nine of these had received desiccated thyroid extract for about ten months before irradiation. Serious loss of vision from the exophthalmos made it seem advisable to try X-ray therapy and to discontinue thyroid medication. In seven cases significant recession was noted. One patient had a recurrence after a maximum recession had taken place. In one of the failures the exophthalmos was increased two millimeters. Clinical observations and techniques are described and recorded. Transient epilation occurred in all of the patients. The average onset of recession of the bulb was three months; the average maximum recession was twelve months. Observations continued for three years after irradiation was discontinued.

F. M. Crage.

Casanovas, J., and Montserrat, S. **Psychogenic amblyopia with a symptomology**

similar to the syndrome of the central nervous system of Dr. J. Gonzalo. Arch. Soc. oftal. hispano-am. 11:148-160, Feb., 1951.

Justo Gonzalo designates his recent work on cerebral disturbances following cranial trauma as the syndrome of the central nervous system. It is characterized by disturbances which are not affected by hypnotic suggestion, but which improve if cerebral activity is modified by stimulation of other functions, such as muscular contraction or sensory excitation. The ocular symptoms consist in a reduction in visual acuity, constriction of the visual field, inversion of the isopters for red and blue, delayed perception, inversion and inclination of images, impairment of adaptation, monocular diplopia, and visual agnosia. Casanovas reports the case of a 28-year-old man who, after a cranial trauma, had the ocular symptoms which comprise the central nervous system syndrome. He found that he could produce similar symptoms in patients with hysteria and also in normal persons by hypnotic suggestion. No change in the symptoms could be produced by hypnotic suggestion in the patient with cranial trauma. Casanovas concludes that there is a psychogenic factor in the pathogenesis of the syndrome of the central nervous system after cranial trauma. Ray K. Daily.

Galindez Iglesias, F. **Psychovisual pathology.** Arch. Soc. oftal. hispano-am. 11:289-316, March, 1951.

The literature on psychovisual disturbances, comprising motor, sensory and congenital, aphasia, apraxia, visual and spacial agnosia, alexia, macropsia and micropsia and visual hallucinations is reviewed and their localizing value described in detail. Hallucinations, while generally associated with cerebral tumors, may result from a lesion of the visual pathway on any level, and are the product of a series of complex cerebral processes. Because cases have been reported in which formed hallucinations could be attributed to lesions in the temporal lobe and unformed photopsias to lesions in the occiptal cortex, the authors do not agree wholly with Weinberger and Grant who consider that hallucinations have no localizing value, and that their complexity depends more on constitutional factors than on their source in the psychic cortex. Ray K. Daily.

Leoz, G. de la Fuente. **The pathogenesis of disturbances in ocular motility, consecutive to a lesion in the medulla.** Arch. Soc. oftal. hispano-am. 11:136-141, Feb., 1951.

The author reports a case of occlusion of the right posterior inferior cerebellar artery with ocular symptoms. The general symptoms included cerebellar vertigo, left hemianesthesia, involvement of the cranial nerves, and of the sympathetic on the same side. The ocular symptoms comprised a paralytic miosis of the right pupil, and a crossed vertical diplopia which was manifest only in a position of rest, and disappeared on activity of the muscle if the eye was directed up or down. The diplopia is attributed to a paresis of the sympathetic fibers which control the tone of the right inferior rectus. The disturbance is attributed to a dissociation between the tonicity of the inferior rectus, which was impaired, and the motility which remained intact. The cervical sympathetic is believed to be involved by the bulbar lesion. The author believes that a systematic search for symptoms of sympathetic disturbances may reveal a greater frequency of sympathetic involvement than has been recognized so far.

Ray K. Daily.

Marner, Else. **Congential bilateral sixth and seventh cranial nerve palsies associated with extremital aplasia (Möbius' syndrome).** Acta ophth. 29:129-137, 1951.

A ten-year-old boy had congenital ab-

ducens and facial palsy with total failure of lateral movements of the eyes, limitation of vertical motility, convergence insufficiency, atrophy of the muscles of the tongue, aplasia of the right breast, and syndactyly of the right hand. (4 figures)
Ray K. Daily.

Vilstrup, Grethe. **The eye reflexes induced by the semicircular canals.** Acta ophth. **29**:163-167, 1951.

In a laboratory study on blinded sharks, the dimensional area within which the individual semicircular canals on accelerated rotation are able to induce eye reflexes was determined. The functional range of the horizontal semicircular canals was found to overlap considerably that of the vertical canals; the axis rotation of the ampullae made a shift in the fundamental range of the semicircular canal, whereas it made no difference whether the canals themselves were moved out of their natural position.
Ray K. Daily.

14
EYEBALL, ORBIT, SINUSES

Grom, Edward. **Acute inflammations of the orbit.** Arch. Soc. oftal. hispano-am. **11**: 241-251, March, 1951.

Eleven patients with acute orbital inflammation were given intramuscular injections of penicillin, and four a combination of penicillin and streptomycin; eleven recovered completely. Four cases, one phlegmon of the orbit, one phlegmon of the orbit and traumatic tenonitis, one tenonitis of the orbit, one abscess of Tenon's capsule ended with optic atrophy. Before the development of antibiotics these inflammations often ended fatally. (7 figures, 1 table, references) Ray K. Daily.

Hesselberg, Charles. **Congenital bilateral anophthalmia.** Acta ophth. **29**:183-189, 1951.

Two cases of congenital bilateral anophthalmia in girls, two and three months old respectively are reported. One child was the offspring of a consanguineous marriage. The sockets should be kept clean in order to prevent secondary infection of the stagnated tears.
Ray K. Daily.

List, C. F. **Progressive extraperiorbital hematoma.** J. Neurosurg. **8**:340-342, May, 1951.

A man, 27 years old, suffered increasing exophthalmos, chemosis, exposure keratitis, visual impairment, pappilitis, extraocular palsies and severe headache from a fractured orbit and skull following a fall. Lateral decompression of the orbit and removal of the hematoma produced a cure. Vascular lesions and cellulitis must be differentiated from this condition. Early, conservative treatment is advisable.
F. M. Crage.

Valière-Vialeix, Ducellier, and Birat. **Metastatic tumors of the orbit.** Arch. d'opht. **11**:249-267, 1951.

The authors report in detail a case of metastatic tumor of the orbit secondary to a kidney epithelioma which occurred in a 63-year-old man. Special characteristics of the tumor included 1. the four years which had elapsed between a nephrectomy and the recognition of the orbital metastasis, 2. its onset in the external rectus muscle, 3. its mobility and encapsulation, 4. the induced hypermetropia which diminished after removal of the neoplasm, and 5. the rapid dissemination of the tumor after surgical intervention. In a review of the literature dealing with the subject, 29 instances of metastasis of epitheliomas to the orbit were found. The organs of primary involvement were, in order of frequency, the breast, the kidney, the prostate, and the thyroid gland. Sympathicoblastoma was found to be a more common type of ocular metastatic tumor (119 cases have been reported) but there

were only six references to metastatic sarcoma of the orbit. The invariably fatal outcome of metastatic orbital tumors is pointed out and the palliative value of roentgen therapy described. The unfavorable effect of surgical intervention has been reported repeatedly.

Phillips Thygeson.

15

EYELIDS, LACRIMAL APPARATUS

Aalde, Ole. **Dacryocystorhinostomy, an analysis and follow-up of 308 operations.** Acta ophth. **28**:523-540, 1950.

Of 308 cases of dacryocystorhinostomy, by Dupuy-Dutemps' technique with some modification of the sutures, 44 were seen at clinic, and the rest were communicated with by letter. A table giving age, brief history, operation, findings on day of discharge, date of follow-up examination, final result and period of observation of the patients examined clinically showed that 85 percent of cases are cured. The case of a three-month-old boy, who had successful bilateral operations is reported in detail. (4 tables) Ray K. Daily.

Beiras, A. **Dacryophotography.** Arch. Soc. oftal. hispano-am. **11**:229-236, March, 1951.

Following his investigations on intranasal examination of the region of the lacrimal sac by means of a scope similar in design to a uretoscope, the author devised an arrangement for photography of this region. It consists of a fixed photographic camera attached to the end of the dacryoscope. The globe of the dacryoscope has to be overloaded and the exposure time adjusted to the sensitivity of the film used. Visualization of the orifice at the junction of lacrimal sac and nasal cavity is of decided advantage in following the postoperative course of a dacryocystorhinostomy. The early recognition and destruction of granulomas and cicatricial bands in the orifice prevents its subsequent occlusion. Dacryoscopy and photography should be of value as a preoperative study in reoperations, in order to determine the cause of the recurrence of the obstruction. (9 figures)

Ray K. Daily.

Enroth, Christiana. **Pterygium and heredity.** Acta ophth. **29**:139-142, 1951.

Pterygium was observed in six of seven siblings. Two brothers, who were stone cutters, were exposed to the effect of an irritating atmosphere. A hereditary factor cannot be excluded. Ray K. Daily.

Ferrante, A. **The lacrimal secretion in paralysis of the seventh nerve.** Ann. di ottal. e clin. ocul. **77**:156-161, April, 1951.

This is a preliminary note on studies to be made and published later. Paralysis of the facial nerve offers an opportunity of studying, almost under experimental conditions, the parasympathetic innervation of the lacrimal gland. Lacrimation is a frequent symptom in facial paralysis but does not necessarily mean increased activity of the gland; more often it is a passive phenomenon due to insufficiency of the orbicularis. Studying the lacrimal secretion in health and disease, Ferrante found that when the quantity of tears is increased the concentration of chlorides is diminished, and vice versa.

Harry K. Messenger.

Ferrié, Jean. **Technique for the repair of cicatricial ectropion of the lower lid in extensive burns of the face.** Arch. d'opht. **11**:52-54, 1951.

Ferrié describes in detail the various problems concerned in the repair of severe cicatricial ectropion and notes that free grafts are not always applicable. He proposes a two-stage technique of repair, the first stage to consist of a cutaneous incision parallel to but at some distance from the free border of the lid. This

enables a tarsorrhaphy to be performed. A curved incision extends from the nasal border of the skin incision to a horizontal line passing through the lower part of the tragus. At this end of the curved incision a second incision is made which is short, straight, and directed obliquely towards the center of the cheek. The flap obtained is then rotated to fill in the original loss of tissue. This leaves a triangular defect near the ear which can later be filled in with a Davis graft. The cosmetic result of this procedure is an improvement over older procedures. Two drawings illustrate well the surgical techniques involved.

Phillips Thygeson.

Frenkel, M., Hellinga, G., and Groen, J. **Case of Sjörgren's syndrome treated with adrenocorticotrophic hormone.** Acta endocrinol. **6**:161-182, 1951.

The authors report a case of Sjörgren's syndrome treated with ACTH. There was a definite improvement that lasted one month after cessation of therapy. During therapy the patient developed a spasm of the right central retinal artery with hypertension and loss of vision in the right eye. Irwin E. Gaynon.

Gonzales, N. B. **Fundamentals of dacryocystorhinostomy.** Arch. Soc. oftal. hispanoam. **11**:114-121, Feb. 1951.

The author believes that the technique of external dacryocystorhinostomy has reached such a state of perfection that good results are obtained even when errors in technique are committed. The trephined opening must be ample and it should reach the inferior margin of the orbit, to avoid forming a diverticulum for the collection of secretion. The bone should be resected as far as the posterior margin of the sac, the mucous membrane flaps should not be excessively tense nor too loose and the remains of the sac and canaliculi should not be subject to displacement by subsequent cicatricial contraction. Perfect drainage of the surgical wound toward the nose should be assured. If no anatomical abnormalities exist results are satisfactory in 99 to 100 percent of cases. The difficulties are greater if these abnormalities involve the canaliculi or the sac, than if they concern the bone or nasal cavities. In tuberculous processes, neoplasm or other grave diseases of the nose, the dacryocystitis is deprived of importance. Anatomical malformations or disease of the nasal cavities do not present insuperable obstacles to dacryocystorhinostomy. Abnormalities in the canaliculi and the sac present major difficulties. Definite cicatricial obstruction in these areas contraindicates dacryocystorhinostomy. Obstruction of one canaliculus and anomalies in the position of the lacrimal puncta do not contraindicate the operation, but the prognosis for the functional result should be guarded. Stenosis of the lacrimal sac through atresia or atrophy accounts for the surgical failures of faultlessly performed operations.

Ray K. Daily.

Marin-Amat. **Bilateral Motais and Holtz operations on the same patient.** Arch. Soc. oftal. hispano-am. **11**:316-319, March, 1951.

A woman, 24 years old, was operated upon first by Motais' operation for congenital ptosis and shortly afterwards by Holtz's operations for blepharochalasis. Ptosis predisposes to blepharochalasis because the paralyzed levator fails in its auxiliary functions of holding up the superior fornix and does not hold the skin of the lids closely against the subjacent tissues. (3 figures) Ray K. Daily.

Tavares, C. L. **Trachoma in Minas Gerais, an endemiological study.** Arq. brasil de oftal. **14**:35-42, 1951.

Trachoma poses a problem in public health in this state of Brazil. An extensive study of numerous communities shows

the prevalence of the disease and shows the importance of considering it on a national level. Many students in the school systems are affected. There is considerable variation in different areas and, in general, rural residents show a higher incidence of infection. This study agrees with other investigations that there is probably a racial immunity in the negro. Relatively few patients are able to secure adequate medical attention because of poverty. Suggestions for control and elimination of the disease include public education, improved hygiene, governmental control of infected patients when necessary, and access to medical attention for all patients. Specific therapy is not discussed in the article.

James W. Brennan.

Thomas, J. B. T. **A modification of Graves' operation for epiphora due to stenosis of the lacrimal punctum.** Brit. J. Ophth. **35**:306, May, 1951.

Thomas advocates the use of sharp pointed scissors in place of a Ziegler knife to slit the canaliculus. It is more satisfactory in obtaining the new triangular opening of the punctum described by Graves as treatment for stenosis of the punctum.

Morris Kaplan.

Valiere-Vialeix. **Dacryocystorhinostomy; indications, technique, results and failures based on 25 years of personal experience.** Ann. d'ocul. **184**:504-521, June, 1951.

When properly performed in selected cases the author found this procedure completely successful in checking suppuration and somewhat less so in restoring lacrimal drainage in 90 cases studied. Its contraindications are: 1. the two extremes of age, 2. severe bodily degenerative conditions such as leukemia, uncompensated cardiovascular and renal diseases, 3. nasal degenerations such as ozena, and polypoid formation, 4. some conjunctival infections such as tuberculosis, trachoma and syphilis, and 5. punctal artesia. The technique recommended is that of Dupy-Dutemps; the largest practical trephine should be used with two sutures to attach the lacrimal tube in the nose.

Chas. A. Bahn.

Willmersdorf, J. C. **Extirpation of the lacrimal gland in patients with epiphora associated with irradiated carcinomata involving the lacrimal passages.** Arq. brasil. de oftal. **14**:43-46, 1951.

Palpebral carcinomata recur easily after irradiation. They involve the lacrimal passages and are associated with epiphora. Removal of the lacrimal gland soon after irradiation will eliminate the epiphora and will not delay the cicatrization, nor adversely affect the globe, as the accessory lacrimal glands adequate moisten the conjunctiva and cornea. Cicatrization may be facilitated by this procedure as it eliminates a traumatic factor due to repeated drying of the eye by the patient's fingers. Recurrences are possible, as with carcinoma elsewhere on the face. Several case histories are reported.

James W. Brennan.

Wilson, Peter. **Acute unilateral dacryoadenitis, report of four patients.** Brit. M. J. **1**:1183, May 26, 1951.

Four cases were observed among 3,622 new patients over a period of six months. There was proptosis and paralysis of the extraocular muscles, with inflammatory swelling, generalized malaise and fever, and tenderness over the malar bone in persons who had had an upper respiratory infection two to three weeks previously. The appearance of a mass in the upper outer quadrant in the upper lids during the season when colds are prevalent should suggest a possible involvement of the lacrimal glands.

Herman C. Weinberg.

16
TUMORS

Avello, Junceda. **Exophthalmos and Recklinghausen's disease.** Arch. Soc. oftal. hispano-am. **11**:179-185, Feb., 1951.

The author reports a very rare case of pronounced exophthalmos, with total loss of vision, in a patient with Recklinghausen's disease. The neoplasm, removed by a Kronlein operation, was found to be a meningioma. This is the first reported case of Recklinghausen's disease associated with a meningioma. (2 figures)

Ray K. Daily.

Babel, J. **A rare form of orbital tumor: the eosinophile granuloma.** Arch. d'opht. **11**:35-38, 1951.

The author reviews the literature on the eosinophile granuloma and refers particularly to the reports of Otani and Erlich and of Lichtenstein and Jaffe who described bone lesions, often multiple, with a predilection for the long bones, the ribs, and the skull. The rare skin manifestations, as well as the rare pulmonary infiltrations, are mentioned, and the few instances of exophthalmos due to eosinophile granuloma of the frontal bone are listed. The latter have occurred in infants and young adults. Babel then reports the case of a woman, 27 years of age, who developed a sudden exophthalmos on the left side with swelling of the lids. When first seen two months after onset the exophthalmos was 6 mm., was irreducible by pressure, and there was limitation of motion of the globe in all directions. The skin of the lids was reddened and the bulbar conjunctiva infiltrated with a poorly defined growth extending back into the orbit. The globe was free from any lesion, and there was no demonstrable systemic disease, but blood examination showed an eosinophilia of 5.5 percent and a basophilia of 18.5 percent. A biopsy of the orbital tumor was performed and showed a typical eosinophile granuloma of the soft tissue of the orbit. After five million units of penicillin for a pneumonitis, the orbital lesion regressed sharply. A mild allergic factor seemed to be present, for each time the patient indulged in pork there was ocular discomfort and swelling of the lids. The author recommends a trial with an antibiotic and concludes that the lesion is probably infectious. Phillip Thygeson.

Enroth, Christiana. **Epibulbar lymphoma of the conjunctiva.** Acta ophth. **29**:143-147, 1951.

A case of isolated epibulbar lymphoma, in a man 49 years old, was diagnosed by biopsy. Such tumors, not associated with a general disease, are rare.

Ray K. Daily.

Ferrante, A., and Moro, F. **Eosinophilic granuloma of the orbital bones.** Ann. di ottal. e clin. ocul. **77**:193-228, May, 1951.

This is essentially a monograph on eosinophilic granuloma, with particular reference to its occurrence in the orbital bones. The authors summarize two cases previously reported by others and report a case of their own which occurred in a 3-year-old child three months after a slight blow. A slowly progressive unilateral exophthalmos was present, with downward displacement of the globe, and the superior, lateral, and inferior walls of the orbit were extensively eroded. The differential diagnosis is discussed at length. Clinical differentiation from Hand-Schüller-Christian disease is very difficult and diagnosis may be impossible without a biopsy. (References)

Harry K. Messenger.

St. Martin, R. **Recurrence of a choroidal tumor after three years; enucleation or evisceration?** Ann. d'ocul. **184**:626-634, July, 1951.

The patient, a 67-year-old woman, had

difficulty in wearing an artificial eye because of a black subconjunctival mass approximately 1.5 cm. in diameter. The eye had been eviscerated three years previously because of a severe glaucomatous attack. Enucleation had at first been refused, later it was performed with a wide excision of the involved conjunctiva and with as much optic nerve as possible. The growth was histologically a melanotic choroidal sarcoma. Another somewhat similar case is also presented. Although clinically the orbital evisceration was considered the safest, the author believes that the outcome would have been the same with either procedure.

Chas. A. Bahn.

Suarez Villafranca, M. R. **Binasal hemianopsia of chiasmatic origin.** Arch. Soc. oftal. hispano-am. 11:252-256, March, 1951.

A 28-year-old woman complained of headache, nausea, polyuria, and loss of vision. The pupils reacted slowly and there was bilateral choked disc with hemorrhage and degenerative symptoms, reduced visual acuity, and binasal hemianopsia with some contraction of the inferior quadrants. X-ray examination demonstrated a tumor of the hypophysis with destruction of the sella turcica; foci of calcification facilitated the diagnosis of a craniopharyngioma. The patient refused operation and the diagnosis could not be confirmed. The value of X-ray examinations is pointed out and the absence of incongruence of the visual fields, characteristic of these tumors, is explained by the compression of the optic nerves, instead of the chiasm, by the anterior cerebral arteries. The circumscribed constriction of the visual fields inferiorly is believed to be caused by pressure on the upper surface of the optic nerves. The choked discs are attributed to lymphatic stasis resulting from compression of the optic nerves. (5 figures)

Ray K. Daily.

18

SYSTEMIC DISEASE AND PARASITES

Christensen, L., Henderson, J., Hollenhorst, R., McLean, J., Gordon, D., and Koteen, H. **Symposium: Collagen diseases.** Tr. Am. Acad. Ophth. pp. 536-575, May-June, 1951.

Christensen, Leonard. **The pathology of collagen disease applied to the eye.** pp. 536-542.

In collagen diseases the basic reaction is a fibroid degeneration. Following changes of the collagen fibrils and mesodermal ground substances, fibroplastic proliferation and infiltration of histocytes and leukocytes occur. The areas involved vary widely in size and intensity. Different parts of the collagen system may be involved alone or together. The primary lesions are usually vascular, segmented as in polyarteritis nodosa, or diffuse as in scleroderma. The cornea, sclera and uveal tract are most frequently affected. Episcleritis, scleritis, some forms of uveitis and scleromalacia are frequently associated with rheumatoid arthritis or other extraocular collagen diseases. Retinal exudation of a characteristic pattern has been observed in patients with acute disseminated lupus erythematosus, dermatomyositis and polyarteritis nodosa, and aneurysmal dilation of the retinal vessels in patients with polyarteritis nodosa. The eyes are frequently involved because of their high collagen content.

Henderson, J., and Hollenhorst, R. **Clinical observations on the use of cortisone in ophthalmic diseases.** pp. 543-564.

Sixteen patients suffering from anterior and posterior uveitis, scleritis, keratitis and vernal conjunctivitis were treated with intramuscular injections of cortisone. Cortisone therapy is especially indicated when foreign proteins have been unsuccessfully used. Relapses may occur when the drug is discontinued too rapidly. In only two cases was discontinuance neces-

sary. Although dramatic improvement occurred in some cases, the author emphasizes that the precise indications and contraindications of cortisone are not yet understood.

McLean, J. M., Gordon, D. M., and Koteen, H. **Clinical experiences with ACTH and cortisone in ocular diseases.** pp. 565-572.

When used intramuscularly 20 to 30 mg. of ACTH were given every six hours and 25 to 50 mg. of cortisone every six hours. Amounts given should maintain a 50 percent reduction of the eosinophiles. Applied topically ACTH is ineffective. Cortisone is given in 10 to 20 percent solution every 1 to 2 hours. Subconjunctivally 0.5 to 1 cc. of cortisone may be given and repeated in two weeks if necessary. Contraindications include moon facies, occasional depression and bodily diseases elsewhere.

Discussion. pp. 573-575.

One of the participants was convinced, on a study of more than 108 cases of different anterior ocular diseases, that subconjunctival injection of cortisone is the most effective method of administration; 0.4 to 0.6 cc. of undiluted cortisone is injected about 5 mm. above the limbus. The eye is previously anesthetized; pontocaine solution is injected and a pledget of cotton with 10-percent cocaine solution is placed at the sight of the injection. Hospitalization is not necessary, the amount of cortisone used is small and the expense is minimal. Cortisone is absorbed in 10 to 14 days when another injection may be given if necessary. No ill effects, local or systemic, were observed. Among the conditions treated were acute and recurrent uveitis and several types of keratitis. Because mesenchymal development and vascular functions are involved in retrolental fibroplasia, ACTH was administered experimentally in daily doses of 20 to 25 mg. for 14 days. The results justified further experimentation.

Chas. A. Bahn.

Damel, C. S. **Two forms of ocular tuberculosis. Perforating tuberculosis of the choroid and primary tuberculosis of the conjunctiva.** Arch. Soc. oftal. hispano-am. 11:122-135, Feb., 1951.

The literature on these rare types of ocular tuberculosis is reviewed and a case of each type reported. The diagnosis was verified by finding the tubercle bacillus and by animal inoculation. The 28-year-old man with perforating choroidal tuberculosis had pulmonary tuberculosis. The 14-year-old boy with primary tuberculosis of the conjunctiva had an adenopathy of the preauricular and submaxillary glands. The seriousness of conjunctival tuberculosis is emphasized, as it is believed that the infection is hematogenous and the patient is apt to develop manifestations of the disease in other areas.

Ray K. Daily.

Esteban, Mario. **Some observations of filariasis.** Arch. Soc. oftal. hispano-am. 11: 406-424, April, 1951.

A case of filariasis with conjunctival manifestations is reported. The administration of hetrazan (chlorhydrate of diethylcarbamil-4-methyl-piperazine) produced a cure. (7 figures, references)

Ray K. Daily.

Frandsen, Emil. **Eye lesions after Calmette vaccination.** Acta ophth. 28:499-510, 1950.

An insidious unilateral uveitis, localized chiefly in the posterior section of the globe and characterized by considerable exudation, developed in three previously Mantoux negative men after Calmette vaccination. The clinical course was that of tuberculous infection in previously non-affected patients. While the disease cannot be attributed with certainty to the vaccination, it raises many questions relative to the advisability of mass vaccination at the end of the school age.

Ray K. Daily.

Iñigo, L. **Ophthalmoscopic symptoms of Rendu-Osler disease.** Arch. Soc. oftal. hispano-am. **11**:362-368, April, 1951.

Rendu-Osler disease is a familial hereditary affection characterized by mucocutaneous telangiectasis and hemorrhage into various organs. A case associated with retinal hemorrhages is reported. (References) Ray K. Daily.

Lee, R. E., and Holze, E. A. **Peripheral vascular hemodynamics in the bulbar conjunctiva of subjects with hypertensive vascular disease.** J. Cl. Investigation. **30**: 539-546, June, 1951.

When the conjunctival vessels of subjects with hypertensive vascular disease are examined with the slitlamp there is metarteriolar narrowing, augmented spontaneous vasomotor activity in the precapillary sphincters and coiling, looping and tortuosity of many larger vessels as well as a heighted sensitivity of the metarterioles and precapillaries to topically applied epinephrine, and a reduced velocity of peripheral blood flow. These changes are also seen in similar vessels in the splanchnic area of animals with experimental renal hypertension. In four persons with normal blood pressure who had had an apparently spontaneous remission of a previous hypertension, the conjunctival vascular bed reacted like that of patients with a sustained hypertension. (5 figures, 1 table)

Herman C. Weinberg.

Polly, H. F. **Collagen diseases: their relation to effects of adrenal cortical and pituitary adrenocorticotropic hormones.** Tr. Am. Acad. Ophth. pp. 517-523, May-June, 1951.

The collagens and albuminoid substances of the white fibers, present in all mesenchymal structures are more numerous in cartilage, bone, and connective tissue, and in the vascular and reticulo-endothelial systems. They are a binding material for mesenchymal tissues and form a part of the bodily defense mechanism. Their structure and function throughout life is primarily maintained by inorganic ions and a complex enzyme system which is closely associated with some of the adrenal cortical hormones. Among these the C-11 oxygenated steroids are apparently the most potent. If these hormones are quantitatively or qualitatively abnormal the individual becomes predisposed to a group of inflammatory-degenerative bodily reactions which are called the collagen diseases. In the skin these diseases include scleroderma, lupus erythematosis, dermatomyositis; in the locomotor system, rheumatic fever, and rheumatoid arthritis; in the vascular system, periarteritis nodosa and some forms of glomerulonephritis, hypertension and allergic reactions. The ocular manifestations will be described in detail in another contribution. The administration of adrenal cortex cortisone or pituitary adrenocorticotropic hormone, which is its central adjunct, does not remove the physicochemical cause of the inflammatory-degenerative reaction. Normal ion exchange and enzymal balance are restored sufficiently for the affected tissues to become normal more rapidly and with less residua than would be otherwise possible. These hormones should be used with special care in the presence of hypertensive cardiovascular disease and glomerulonephritis, cardiac decompensation and old rheumatic carditis, diabetes mellitus, active tuberculosis, frank or latent psychoses, and marked osteoporosis.

Chas. A. Bahn.

Sarkies, J. W. R. **Ophthalmoscopic detection of microfilaria of onchocerca volvulus.** Lancet. **1**:1205-1206, June 2, 1951.

Three hundred fifteen patients were examined with ophthalmoscope and slit-

lamp; 20 were found to have microfilaria by the use of the ophthalmoscope with a plus 20D to a plus 28D lens held 3.5 to 5.0 cm. from the center of the anterior chamber; 34 were found with the use of both the ophthalmoscope and the slitlamp and only one with the slitlamp alone. The ophthalmoscope offers a greater chance of success in finding the microfilariae especially if there are not many, and it provides a simple means for diagnosis of ocular involvement in the early stages. Herman C. Weinberg.

Straub, Wolfgang. **Ocular findings in proven human infection with toxoplasma.** Deutsche Med. Wchnschr. **76**:890-892, July 6, 1951.

In five cases of congenital toxoplasmosis bilateral central choroiditis, microphthalmus, optic atrophy, lens opacities and iridocyclitis were among the important eye findings. Toxoplasmosis should be suspected in infants with cerebral symptoms and concurrent eye-findings. X-ray findings of intracerebral calcification and a positive Sabin-Feldman test make the diagnosis definite. A case with tapetoretinal degeneration in one eye and a retrolental fibroplasia in the fellow eye showed a positive Sabin-Feldman test. Perhaps the picture of retrolental fibroplasia can be produced by toxoplasmosis? Seventy-three adult eye patients at the University Clinic at Tuebingen had positive laboratory tests for toxoplasmosis. The ocular findings ranged from simple choroiditis to retinal hemorrhages and subretinal exudates. Over half the adults who had positive tests had unilateral or bilateral iridocyclitis. Acquired toxoplasmosis may be an important cause of uveitis. Two cases could be proven histologically. An antimony preparation showed greater therapeutic promise than aureomycin. (References)

Max Hirschfelder.

Vianna, E. V. **Ophthalmomyiasis due to Dermatobia cyaniventris.** Arq. brasil. de oftal. **14**:47-54, 1951.

Parasitic infestation of the lids and conjunctiva by the larva of Dermatobia cyaniventris, or bot fly, is reported and several methods of therapy are mentioned, with special emphasis upon the author's method of extracting the larva. In the 77 recorded cases the condition was found more frequently in children who live in rural areas. Only two cases have been reported in adults. Lids, conjunctiva and lacrimal sac are most commonly invaded. Eggs of the adult are deposited by an intermediate host beneath the skin, where the larvae develop, producing a swelling and inflammatory reaction. Treatment consists of removal of the larva, either by curettage or actual extraction of the larva with fine toothed forceps, such as iris forceps. (6 figures) James W. Brennan.

19

CONGENITAL DEFORMITIES, HEREDITY

François, J., and Lambrechts, J. **Congenital posterior polar cataract due to dominant heredity.** Ann. d'ocul. **184**:423-432, May, 1951.

In the 117 members of seven generations of a family, 37 persons had specific types of cataracts. These included the posterior polar, present at birth, and the posterior cortical, which began between the ages of 3 and 28 years. The former is rose-petal shaped and often coexists with hyaloid remains; the posterior cortical type consists of punctate and striate opacities which are densest equatorially. In both forms maturation is rapid. No ocular or extraocular degenerative stigmata were observed. Calcium and phosphorus studies were normal and none of the factors termed genetic markers showed the implication of any specific gene in the predisposition to cataract.

The method of transmission was dominant; only those affected transmitted the predisposition to their descendants.

Chas. A. Bahn.

Grom, E., Herrera, A., and Ettedgui, J. **Craniofacial dysostosis and its ocular symptoms.** Arch. Soc. oftal. hispano-am. **11**:395-405, April, 1951.

Only 10 cases of Crouzon's disease have been reported. The authors' case was first seen when the child was two months old, and was followed for 16 months. The Kahn reaction was positive. X-ray examination showed an acrobrachycephaly, with premature synostosis of the coronal, sagittal and facial sutures. There was a diminution in the size of the orbit, marked exophthalmos, nystagmus, a deviation of the eyes, the head held backward, slight miosis of the pupils and slow reaction to light, absence of protective blinking, postneuritis atrophy and, in the right fundus, a zone of retinal atrophy. The causes of edema and atrophy of the optic nerves are discussed. (6 figures) Ray K. Daily.

Hudelo, A. **Astigmatism and malformations of the superior maxillary arc.** Ann. d'ocul. **184**:522-530, June, 1951.

The frequent occurrences of high astigmatism in persons with specific facial patterns prompted the author to carefully analyze 25 cases. He found in the large majority that the superior maxilla was keel shaped, and the palate highly arched. These facial characteristics in the formative period of the orbit, globe, and ocular muscles predispose the individual to imbalanced scleral tension for a sufficient time to alter the corneal curvature and probably also accommodation and lens position. Chas. A. Bahn.

Lodberg, C., and Lund, A. **Hereditary optic atrophy with dominant transmission.** Acta ophth. **28**:437-468, 1950.

Five Danish families with dominant hereditary optic atrophy were studied. There were 72 patients, 39 of whom have been examined. Dominant optic atrophy is the most frequent form of hereditary optic atrophy. The authors suggest that there are two forms: 1. congenital, and 2. a form acquired in childhood which appears between the sixth and eighth year of life. The dominant congenital form is the more severe and is characterized by nystagmus, vision very often reduced to hand movements, or more or less complete blindness. In the acquired form the loss of visual acuity is less severe and not altogether disabling and the optic atrophy remains stationary throughout life. (7 pedigrees, 26 references) Ray K. Daily.

Skeller, E., and Øster, J. **Eye symptoms in mongolism.** Acta ophth. **29**:149-161, 1951.

In a study to determine the incidence of the various ocular symptoms in mongolism, 81 mongoloid patients in the various institutions for mental defectives in Denmark are reported upon. An upward and outward slant of the palpebral fissures was present in 71 percent of cases, epicanthus in 21 percent, blepharoconjunctivitis in 67 percent, keratoconus in six percent, characteristic white splashes in the hypoplastic stroma of the peripheral part of the iris in 86 percent, lens opacities in 46 percent, convergent strabismus in 31 percent, divergent strabismus in 3 percent, and nystagmus in 17 percent. There was slight hyperopia in 58 percent, emmetropia in 25 percent, hyperopia 9 percent, and myopia in 8 percent. (3 figures, 2 tables) Ray K. Daily.

NEWS ITEMS

Edited by DONALD J. LYLE, M.D.
601 Union Trust Building, Cincinnati 2

News items should reach the editor by the 12th of the month but, to receive adequate publicity, notices of postgraduate courses, meetings, and so forth should be received at least three months before the date of occurrence.

ANNOUNCEMENTS

NEW YORK POSTGRADUATE COURSE

The Department of Ophthalmology of the New York State University Medical Center at Syracuse, New York, will present its second annual postgraduate course November 30 and December 1, 1951. The following guest speakers will participate: Dr. Derrick Vail, Dr. Frank B. Walsh, Dr. Irving H. Leopold, Dr. Walter S. Duggan, Mr. Aurel E. Mangold. Inquiries should be addressed to Dr. Harold H. Joy, State University Medical Center, Syracuse, New York.

MEMPHIS POSTGRADUATE COURSE

The annual postgraduate course sponsored by the Memphis Ophthalmological and Otolaryngological Society will be held on February 9, 10, and 11, 1952. The speakers will be: Dr. Alan C. Woods, Dr. Algernon B. Reese, Dr. John F. Gipner, Dr. O. E. Van Alyea, Dr. Charles E. Kinney, and Dr. W. W. Morrison. For further information address the secretary: Dr. Roland H. Myers, Exchange Building, Memphis, Tennessee.

YALE UNIVERSITY POSTGRADUATE COURSE

Guest lecturers for the postgraduate courses in ophthalmology of the Yale University School of Medicine to be given from October, 1951, to June, 1952, at the Eye Clinic, fourth floor, Clinic Building, Grace-New Haven Community Hospital, New Haven, Connecticut, are:

Dr. Girolamo Bonaccolto, New York; Dr. Isadore Givner, New York; Dr. Adolph Posner, New York; Dr. Charles L. Schepens, Boston; Dr. Abraham Schlossman, New York; Dr. Frederick H. Theodore, New York; and Dr. Arthur C. Unsworth, Hartford, Connecticut. Members of the staff will also lecture.

The 1951-1952 schedule is:

October 12—"Boeck's sarcoid," Dr. J. Alexander van Heuven; October 26—"Biologic and therapeutic effects of low-voltage X rays on the eye," Dr. I. Krasso de Suto-Nagy.

November 9—"Retrolental fibroplasia," Dr. Unsworth, Dr. R. B. Griffiths, Dr. S. P. Griffiths, and Dr. R. M. Fasanella; November 30—Round Table Discussion: "Testing functions of ocular muscles," Dr. C. C. Clarke; "Centers for ocular muscles," Dr. Robert B. Livingston; "Neurologic syndromes involving ocular muscles," Dr. Ernest Sachs.

December 14—"Allergic conjunctivitis," Dr. Theodore. December 21—To be announced.

January 11—"Headache: Practical aspects of diagnosis and treatment," Dr. William J. German, Dr. John H. Heller, Dr. John A. Kirchner, and Dr. R. M. Fasanella. January 25—Round Table Discussion: "Surgical technique of extraction of dislocated lens," Dr. Bonaccolto.

February 8—"Practical aspects of orthoptics," Dr. Schlossman; February 29—"The management of complications in cataract surgery," Dr. Arthur M. Yudkin.

March 14—"Retinal separations," Dr. Schepens; March 28—Review of Dr. A. B. Reese's *Tumors of the Eye*, with cases from New Haven Hospital, Dr. David Freeman.

April 11—"Secondary glaucoma," Dr. Posner; April 25—"Lens extraction with the erisophake: Review of method and results," Dr. Francis P. Guida.

May 9—"Associated skin and eye manifestations of general disease," Dr. Givner; May 29—"Low-tension glaucoma," Dr. Frederick A. Wies.

UNIVERSITY OF TORONTO GRADUATE TRAINING

The University of Toronto, Faculty of Medicine, offers a postgraduate course in ophthalmology extending over three years. The graduate instruction in ophthalmology in the teaching hospitals in Toronto has been coördinated under the direction of the university. The first year on a fellowship, the value of which is approximately $1,400.00, the student spends in one of the basic sciences of ophthalmology, and the final two years are spent on the intern service of one or more of the university teaching hospitals. Approximately four hours of didactic teaching are arranged for the students by members of the staff each week from October to May. On Saturday mornings staff ward rounds are made at the Toronto General Hospital and are attended by the interns from the other teaching hospitals.

A sound knowledge of neurology and metabolic diseases is desirable. The following courses are given: Geometric and physiologic optics, physiology of the eye, principles and practice of biomicroscopy, perimetry, ocular therapeutics, medical ophthalmology, pathology of the eye, bacteriology and external diseases of the eye, embryology and developmental anomalies of the eye, ocular motor anomalies, anatomy of the orbit, skull and brain, radiologic ophthalmology, industrial ophthalmology, intraocular and plastic surgery, pathology of the visual pathways, refraction, neuro-ophthalmology, glaucoma. Senior interns are given instruction in the preparation and presentation of scientific papers.

The fee for instruction is $50.00 per year payable to the chief accountant, University of Toronto.

An application for appointment may be made to the professor of ophthalmology, Faculty of Medicine, University of Toronto. Appointments are made in December to commence on the following July 1st.

Florida midwinter seminar

The sixth annual University of Florida midwinter seminar in ophthalmology and otolaryngology will be held January 14 and continuing through January 19, 1952, at Miami Beach.

The lectures on ophthalmology will be presented on January 14th, 15th, and 16th and lecturers will include: Dr. Alson E. Braley, Iowa City, Iowa; Dr. John M. McLean, New York; Dr. Wendell Hughes, Hempstead, Long Island; Dr. Irving H. Leopold, Philadelphia; and Dr. Bruce Fralick, Ann Arbor, Michigan.

On Wednesday evening, January 16th, all registrants are cordially invited to attend the midwinter convention of the Florida Society of Ophthalmology and Otolaryngology. All meetings will be held at the Sans Souci Hotel. Registration fee for the seminar is $40.00. A check for $10.00, payable to the University of Florida Midwinter Seminar, must accompany your application to Dr. Walter T. Hotchkiss, 541 Lincoln Road, Miami Beach, Florida. This is not returnable. The remainder of the registration fee will be paid at the seminar desk at the Sans Souci Hotel on arrival.

The division of ophthalmology is represented by Dr. Shaler Richardson, Jacksonville; Dr. Nelson M. Black, Miami; Dr. Charles Boyd, Jacksonville; and Dr. Bascom Palmer, Miami.

Stanford conference

The Stanford University School of Medicine will present the annual postgraduate conference in clinical ophthalmology from March 24 through 28, 1952. The program this year will be devoted to ophthalmic surgery. Registration will be open to physicians who limit their practice to the treatment of diseases of the eye, or eye, ear, nose, and throat. In order to allow free discussion by members of the conference, registration will be limited to 30 physicians.

Instructors will be Dr. A. Edward Maumenee, Dr. Dohrmann K. Pischel, Dr. Jerome W. Bettman, Dr. Max Fine, Dr. Earle H. McBain, and Dr. Arthur J. Jampolsky.

Programs and further information may be obtained from Office of the Dean, Stanford University School of Medicine, 2398 Sacramento Street, San Francisco 15, California.

Societies

Gill residents meet

The annual meeting of the former residents of the Gill Memorial Eye, Ear, and Throat Hospital was held on September 17th. The following papers were presented:

"Foreign bodies of the maxillary sinus," Dr. Paul T. Meyers, Johnstown, Pennsylvania; "Cancer of the cornea with multiple skin cancers," Dr. G. A. Smith, Montgomery, West Virginia; "Melanosarcoma of choroid," Dr. R. M. Ferrell, Lewisburg, West Virginia; "Surgical management of crossed eyes," Dr. E. G. Gill, Roanoke, Virginia.

The officers of the association are: President, Dr. F. Buerk Zimmerman, Louisville, Kentucky; 1st vice-president, Dr. Keith Gerchow, Morgantown, West Virginia; 2nd vice-president, Dr. R. M. Ferrell, Lewisburg, West Virginia; secretary-treasurer, Dr. H. L. Bell, Roanoke, Virginia.

Personals

The Schoenberg Glaucoma Prize of $500.00 has been awarded by the National Society for the Prevention of Blindness to Dr. Adolph Posner and Dr. Abraham Schlossman, New York, for a paper entitled: "Studies in glaucoma with special emphasis on its early recognition." The award was announced at the October 8th meeting of the New York Society for Clinical Ophthalmology.

Dr. Dan Gordon of the Department of Ophthalmology, Cornell University, New York, spoke to the Hawaii EENT Society on the "Use of ACTH and cortisone in ophthalmology" on September 6th. He also spoke before the Honolulu County Medical Society on "Recent advances in the use of ACTH and cortisone."

Dr. Arthur Alexander Knapp, New York, on invitation from the British Medical Association, West Indies Branch, gave a talk on, "Uveitis and retinitis pigmentosa: Cure and treatment," on September 5th. He also showed a Kodachrome movie on "Tattooing with iridectomy in keratoconus." The meeting was held in Port of Spain, Trinidad, British West Indies.

Dr. Derrick Vail, Chicago, has been elected an honorary member of the Royal Society of Medicine, Section of Ophthalmology, and an honorary member of the Greek Ophthalmological Society.

Dr. Paul A. Chandler, Boston, will deliver the fifth annual Mark J. Schoenberg Lecture on glaucoma at the New York Academy of Medicine on Monday, December 3rd, at 8:30 p.m.

This lectureship was established as a memorial to the late Dr. Schoenberg's interest in the prevention of blindness from glaucoma. It is jointly sponsored by the National Society for the Prevention of Blindness and the New York Society for Clinical Ophthalmology.

The title of Dr. Chandler's talk will be "Narrow-angle glaucoma."

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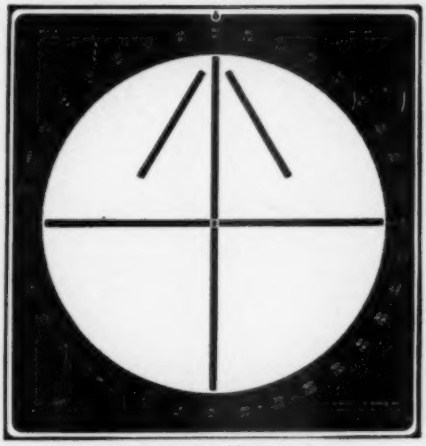

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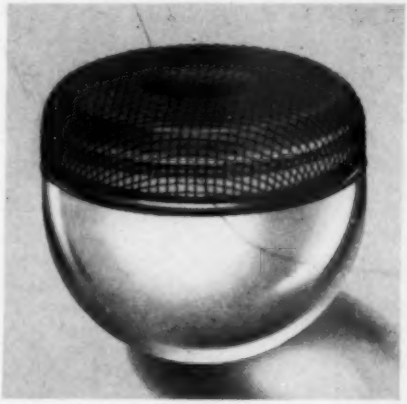

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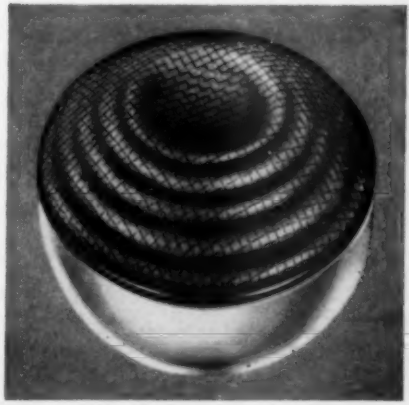

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